American Machinist

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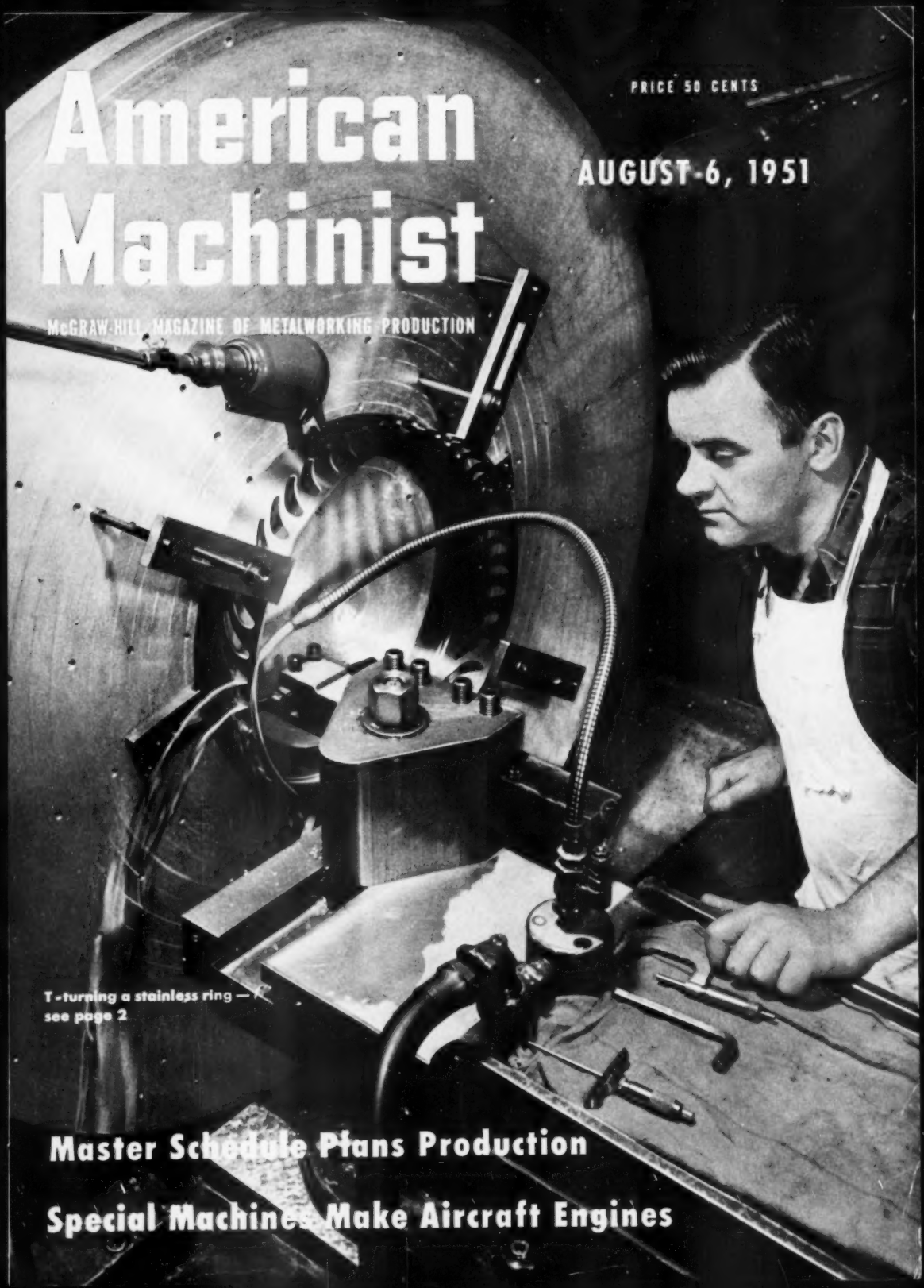

T-turning a stainless ring — see page 2

Master Schedule Plans Production

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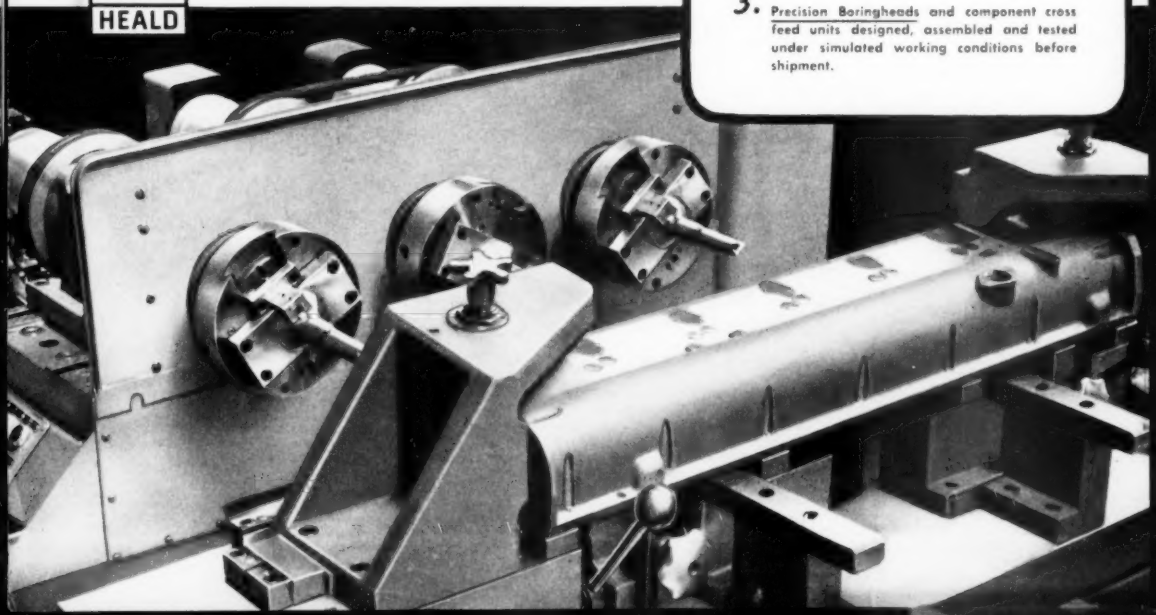

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Chips and QUIPS

No Climbing... Pratt & Whitney Aircraft, East Hartford, Conn., has faced a number of unusual jobs as production methods for Turbo-Wasp jet engines were developed. For example, large-diameter, thin-walled, stainless shroud rings and tailpipes posed quite a machining problem. Pieter Schipper, then chief of the experimental division, took accumulated ideas to Herb Myers, vice-president of Lodge & Shipley. These ideas, plus some suggestions from Daniel Provan, a foreman in the experimental machine shop, resulted in the lathe pictured on our front cover. Called formally a 60-in. right-angle lathe, informally a T-lathe, it has ways at right angles to the chuck axis, no tailstock, handles work to 48 in. in diameter, has a standard 25-in. headstock and 11½-in. bore. It takes half the floorspace required by the standard lathe, uses less power, the operator can see the cut easily from normal working position, and loading is simple. Gone is the need for climbing up on the ways to see how the cut is going, according to Walter Tevlin, the operator.

The unit pictured is one of five installed. It has an aluminum faceplate 54 in. in diameter clamped on the chuck. Work is held by studs into ⅜-in. tapped holes, of which there are seven in each of 16 radii. 25 spindle speeds from 4 to 225 rpm, and 55 feeds from 0.001 to 0.0064 ipr, will easily attain required tolerances of ±0.001 in. Cost is several thousand dollars less than that of a standard unit. Coolant in use on the nozzle-vane inner support ring pictured is Cimcool. The material is AMS 56-51 stainless, and the tool carbide (HSS is used over the perforated area).

This machine and four other special types similarly developed are described in an article by A. A. Merry, chief tool engineer, in this issue.

Maintenance... We rarely publish maintenance articles—too much production information to pass on. And nobody really enjoys maintenance work—or cares much for deadly schedules. However, we found at Allis-Chalmers a tremendous collection of valuable tips on maintaining induction-heating apparatus. We've put it into a 16-page Special Report that will help you keep this new type of equipment in tip-top order.

Radius Cutting... Chester Ricker, our Detroit Editor, tells how one Detroit company cuts radii on the shaper. He includes a table of horizontal and vertical feed increments, details the method—and throws in for good measure an explanation of an automatic feed for a band-saw.

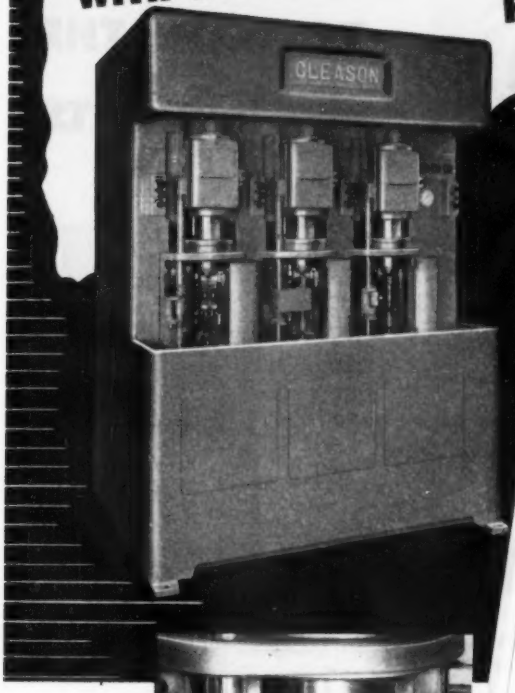
Master Schedule... When we described the modernization program at Saco-Lowell (*AM*, April 16), we couldn't tell the whole story, even in 20 pages. So we went back to get details on two further ideas—production control and materials handling. Wendell Lund, assistant to Works Manager Vaule, who developed and installed the production-control system, describes how master schedules are set up for complicated and varied products, shop orders issued, and progress checked to insure shipping time. The system gives tight control, yet provides flexibility and copes adequately with job-lot production.

Trailers... Many Americans live in trailers these days, so we give you, in two quick pages of pictures, the story of how extruded aluminum shapes are bent to form one-piece nose and rub rails. Proper tooling makes tremendous savings in cost and weight, holds trailer costs down.

Coming... *AM* for Aug. 20 will feature an unusual Special Report—really a group of reports on various methods of gear making without cutting the teeth. Methods include die and investment casting, powder metal, extrusion, cold drawing and injection molding... The issue will also mark the beginning of a notable series of articles on the relationship of metallurgy to machinability, dealing in basic data... There'll be articles, too, on materials handling, spline cutting, portable milling, and chrome plating, plus our usual departments. The cover will picture Superfinishing.

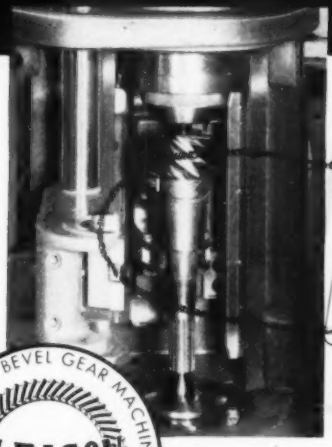
PRODUCTION MANAGER . . . Born in Rhode Island 35 years ago, Wendell B. Lund spent his first 31 years there. He was graduated from Brown University in Providence with a BA and a membership in Phi Beta Kappa, then went immediately to Brown & Sharpe. He completed the machinist apprenticeship, then came up through the ranks as sub-foreman, asst foreman, dept foreman, and was asst works supt for five years during World War II. In 1946, he became general manager of Lincoln Engineers, Inc., in Saylesville, but in October, 1947, he moved down into Maine to join Saco-Lowell. For the last three years, he has been production manager there, now is assistant to the works manager and also in charge of coordinating company defense work. Last fall, Saco-Lowell sent him to Harvard Graduate School of Business Administration, where he completed the advanced management program. He describes S-L production control in this issue.

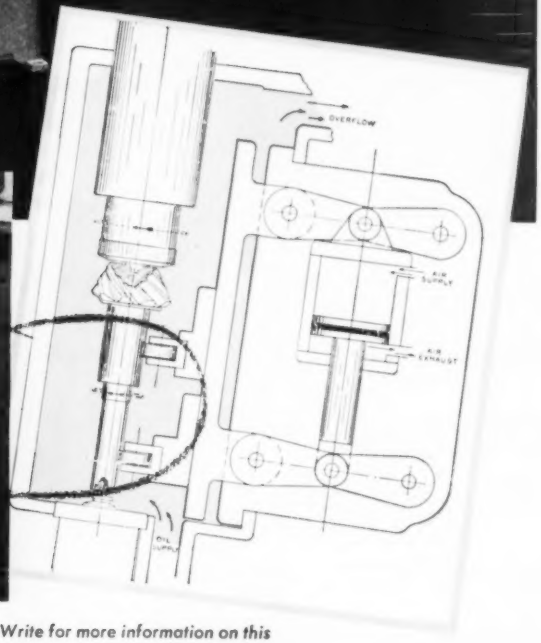
ELIMINATE DISTORTION
WITH THE GLEASON No. 16 PINION QUENCHING PRESS



The Gleason No. 16 Pinion Quenching Machine is a distinctively different type of quenching machine. It is designed with three multiple units, each operating independently of the other and assures continuous fast production of hardened pinions. Further straightening of shafts is unnecessary.

A pre-set metallurgically correct oil flow is provided which, when once set, makes this machine completely automatic in operation from the time the pinion is placed in the loader jaws until it has passed through the quench and returned to unloading position. During the quench, while rotating on centers, shafts are held against rollers to prevent distortion.





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What you should know about Surface Broaching

. . . TO GAIN THE

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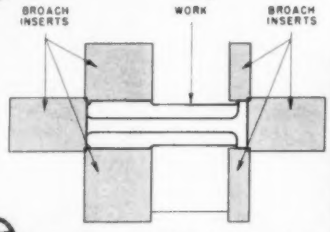
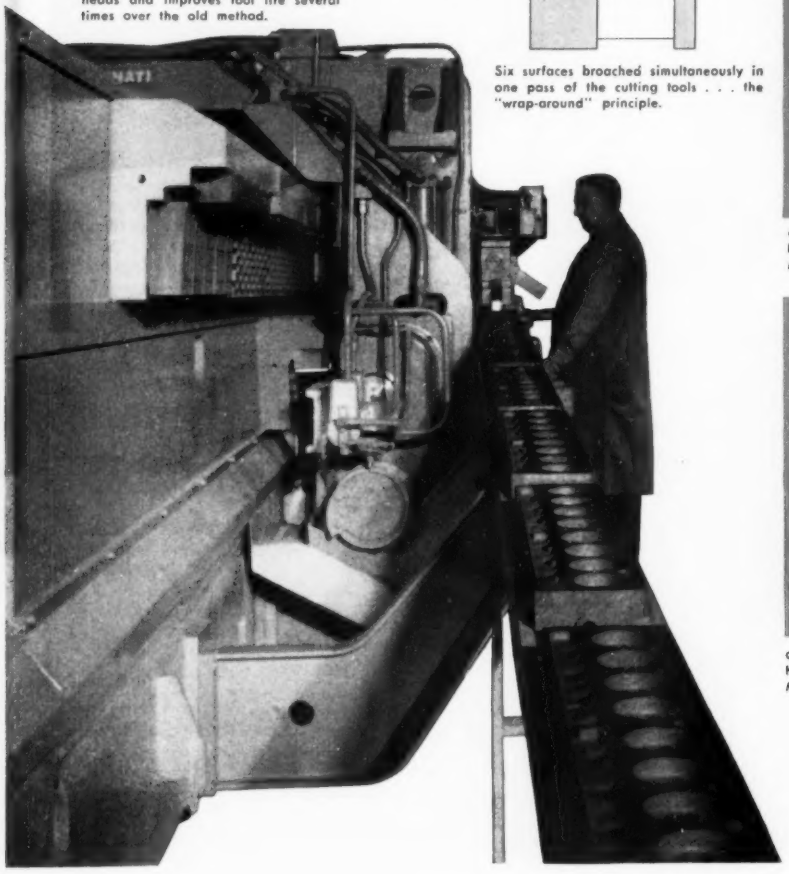
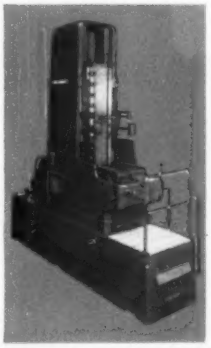


Six surfaces broached simultaneously in one pass of the cutting tools . . . the "wrap-around" principle.

High speed carbide broaching—a new development by Cincinnati—increases production of cylinder blocks and heads and improves tool life several times over the old method.





CINCINNATI Single Ram Vertical Hydro-Broach. Catalog No. M-1389-2.

CINCINNATI Duplex Vertical Hydro-Broach. Catalog No. M-1709-1.

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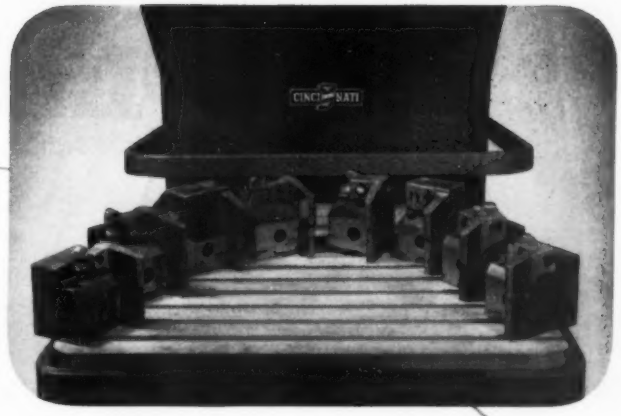

Similar parts broached on one machine, employing interchangeable fixture elements.

FULL BENEFIT POSSIBILITIES

Basic considerations for a good surface broaching application are rather simple, but perhaps not so well known. They are here listed for those who want to take advantage of the low-cost production possibilities of broaching, but are not quite sure of the application.

a) The cutter teeth must pass across the face of the surface to be machined, without interference from work or fixture.

b) You should have sufficient production on a continuous basis to justify the initial cost of tooling. For instance, a continuous production of 10 to 15 pieces per hour would hardly justify a broaching installation unless there are a number of repetitive cuts, such as the "Christmas tree" slots in turbine wheels.

b-1) Or on a lot production basis, you should save a sufficient quantity of similar parts to justify tooling cost plus the change-over time from one part or size to the next. The parts should be of the same general form, and require only minor tool changes.

c) Other conditions being favorable, several surfaces can be broached simultaneously in one or more settings of the work. For example, several surfaces can be broached in one or more work stations, or in one pass of the tool.

d) The part must be strong enough to withstand the broaching thrust, or at least so designed that it can be adequately supported.

e) Depth of broaching cut should be uniform, and within as narrow limits as possible.

When you've decided that surface broaching is the best process for the machining operation under consideration, then the next step is to select a CINCINNATI. You'll be choosing a machine that will give you a long life of low-cost, accurate performance. And our Application Engineers are ready to help you with your tooling problems. Write for catalogs No. M-1389-2 and No. M-1709-1.

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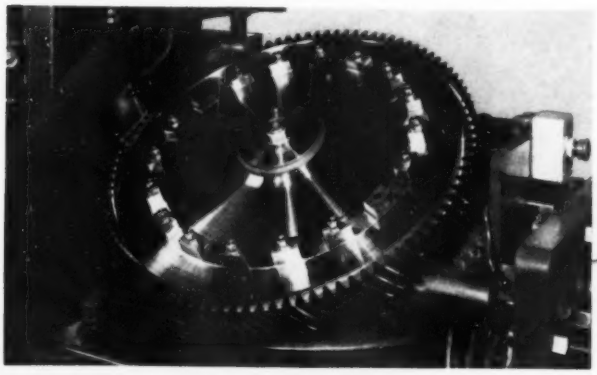
CINCINNATI 9, OHIO



Repetitive cuts make this turbine wheel slotting operation economical for broaching.

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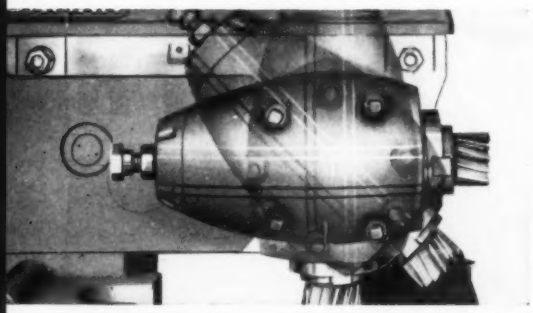
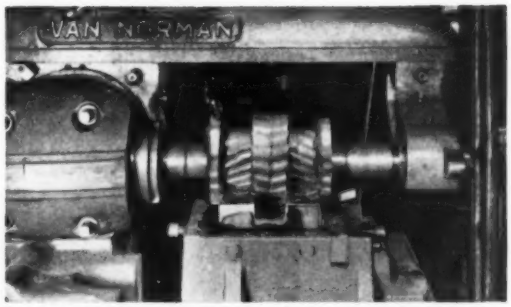
MILLERS Cut High Production Costs

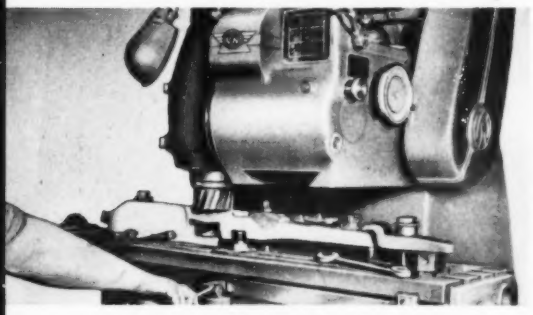
BY REDUCING IDLE MACHINE TIME



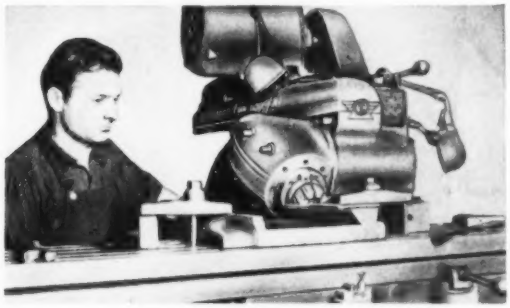
Adjustable Cutterhead permits horizontal, angular or vertical milling on one miller. This versatility is equal to several single purpose machines.



Horizontal Milling — Simply lock head in horizontal position and you're ready for horizontal milling. Ram-type overarm and outer support assures rigidity and accuracy.



Vertical Milling — With the cutterhead in vertical position, the operator is taking a vertical cut on the work piece.



Angular Milling — Lock the cutterhead in any desired angular position and you're ready for angular milling. Graduated dial in degrees makes positioning easy.

VAN NORMAN RAM TYPE MILLERS give you every advantage in reducing milling costs. The adjustable cutterhead reduces idle machine time to an absolute minimum. It permits one machine to perform horizontal, angular or vertical milling. There is no waiting for single purpose millers because practically all milling operations can be accomplished on the Van Norman Ram Type Miller. In addition, work setups are reduced and the operator gets out more work.

Van Norman Ram Type Millers are easy to operate. Front and rear controls permit operation from either location. Hardened and ground steel fixed cutterhead stops permit true settings at horizontal or vertical position. The rugged construction throughout assures accuracy and long life.

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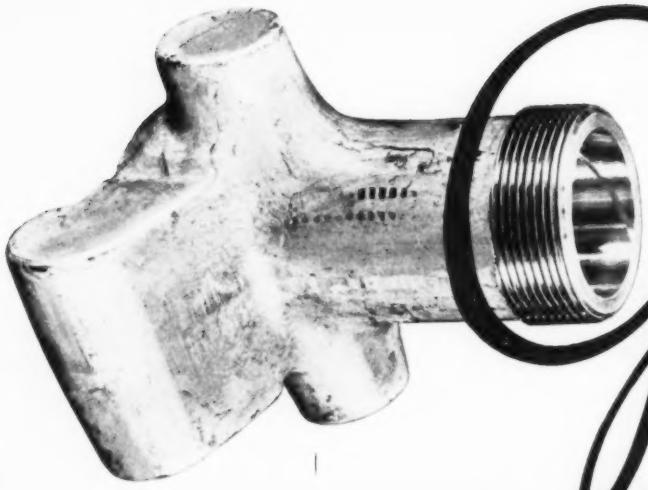

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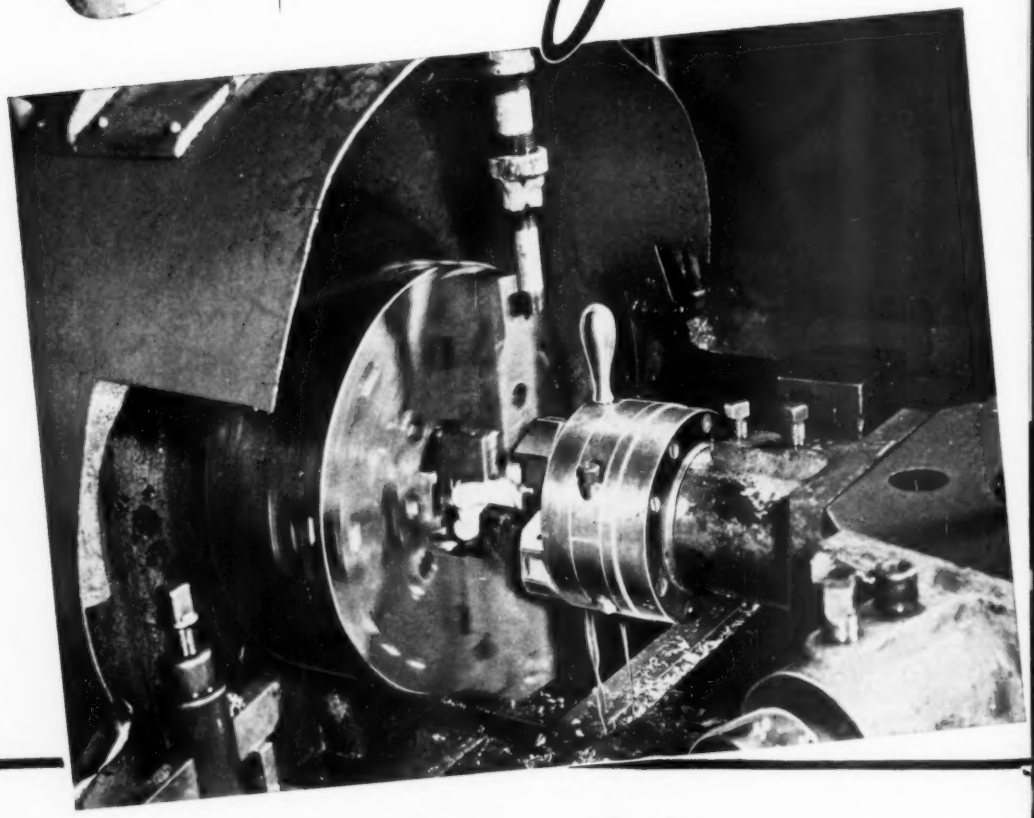

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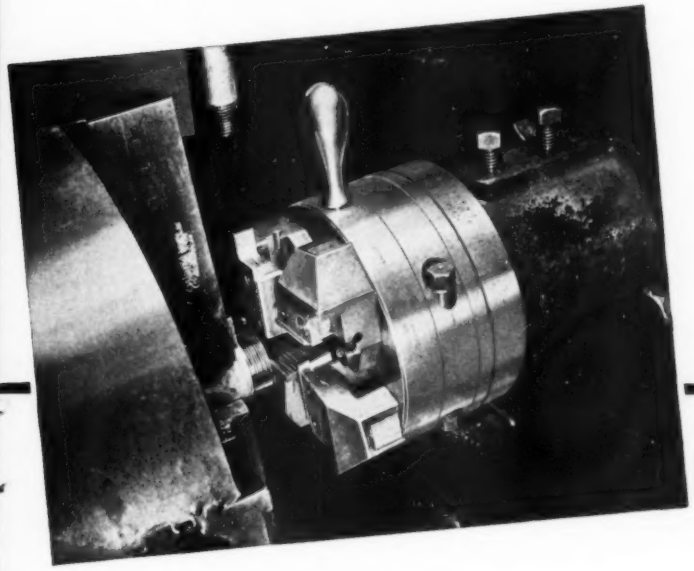
• The permanent nut action of Landis Tangential chasers assures accurate pitch threads throughout on the crown port closing bodies used in bottling machinery. As illustrated, 1 5/8" 16 pitch USS threads are cut 1/2" long on naval bronze forgings. These threads are generated by Landmatic Heads using Landis Tangential Chasers at the rate of 50 SFM. Actual threading time is about 5 seconds.

• The permanent throat feature of the chasers maintains initial cutting accuracy throughout the entire life of the tool. When the chaser is reground, no grinding is done on the throat. Thus the throat angle and nut action is never altered and enables the chaser to consistently produce threads accurate for lead. For further information, on Landis Die Heads & Tangential chasers, write for Bulletins F-80, F-90 & A-50.



These photographs were taken in the Machine Manufacturing Division of the Crown Cork & Seal Company, Inc., Baltimore, Maryland.

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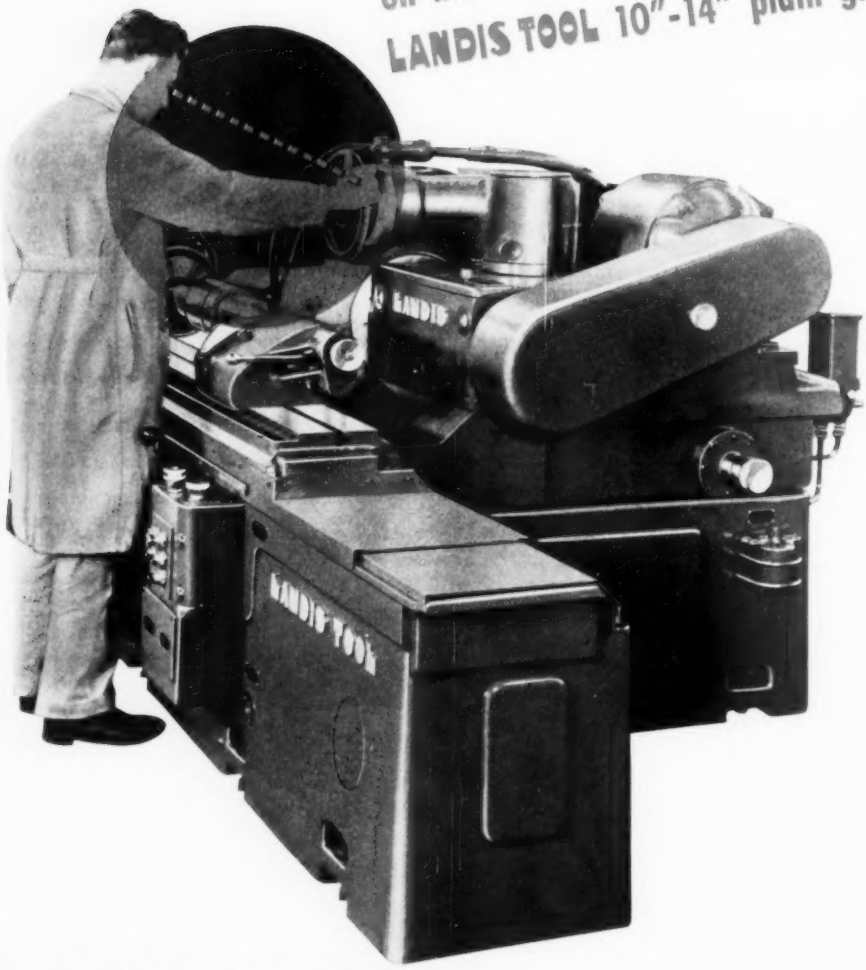

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LANDIS TOOL
Precision Grinders

For proof of how features of LANDIS TOOL Plain Grinders pay off in production, send prints of your work pieces for production estimates.

GRINDING WHEEL FEED AT EYE LEVEL

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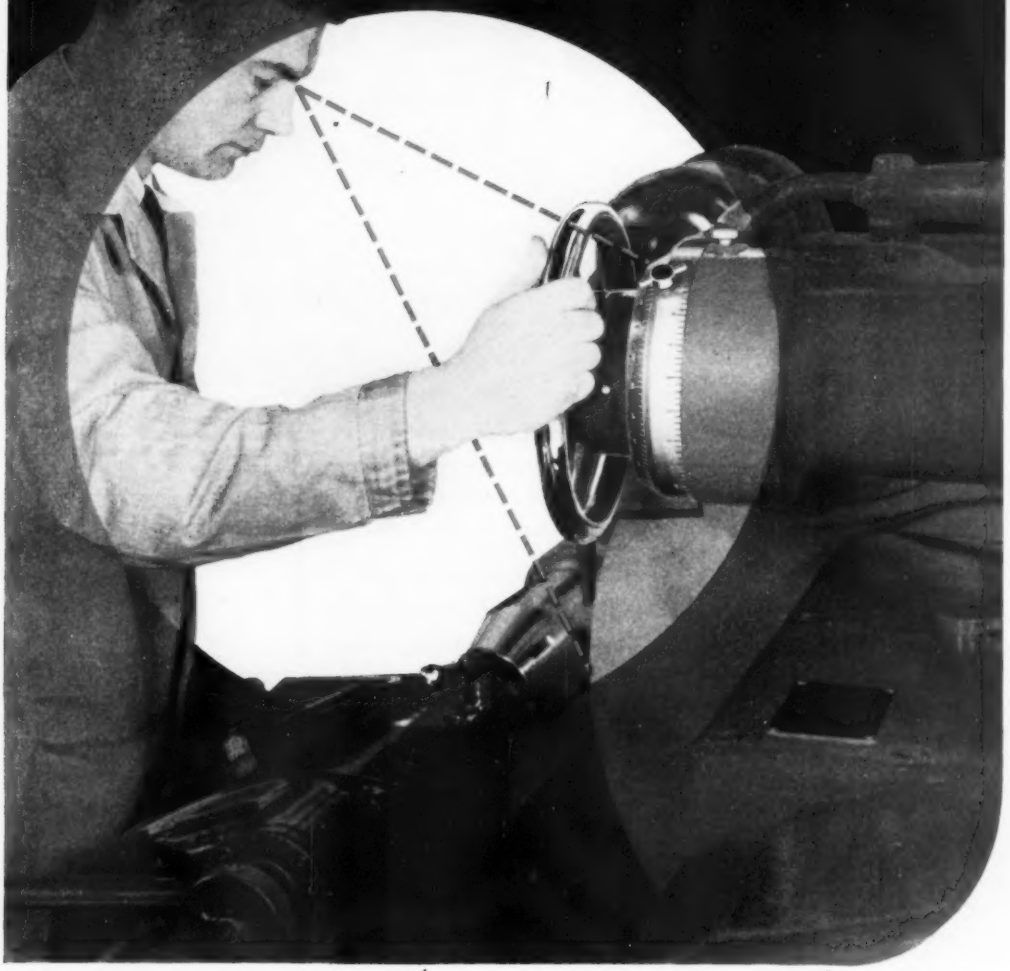
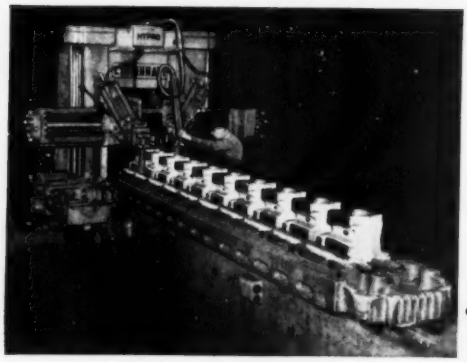
- No tiresome bending or stooping
- Large easy-to-read graduations
- Sensitive and accurate grinding wheel feed

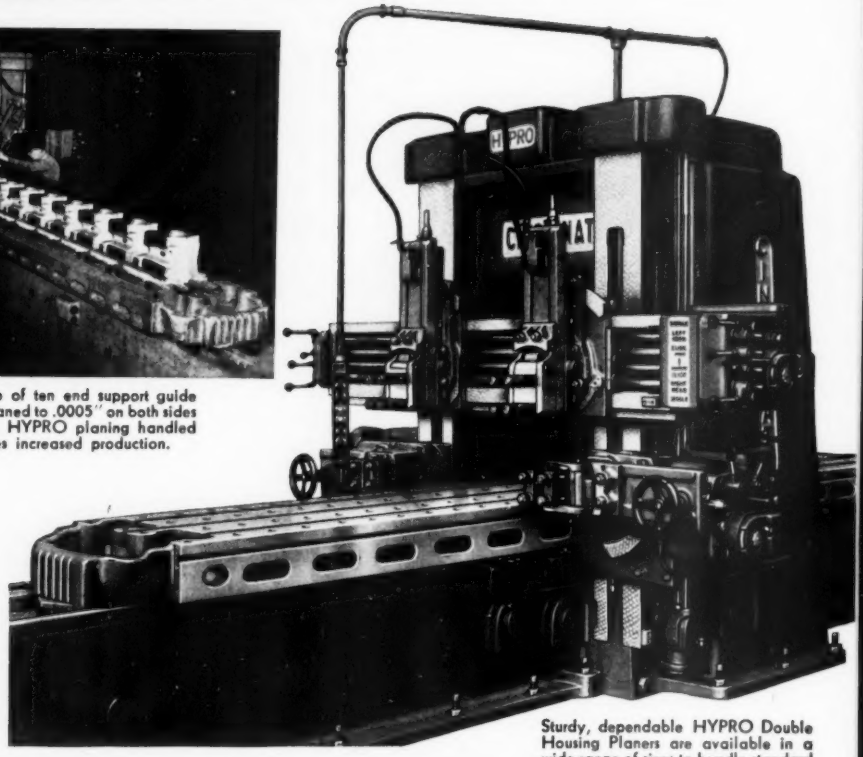


LANDIS TOOL COMPANY / WAYNESBORO, PENNA. / U. S. A.

Where your production needs demand greater work output.



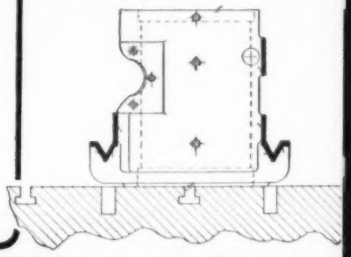
"In-line" set-up of ten end support guide blocks being planed to .0005" on both sides simultaneously. HYPRO planing handled this way insures increased production.



Sturdy, dependable HYPRO Double Housing Planers are available in a wide range of sizes to handle standard and special work of all types.

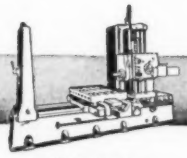
GUIDE BLOCK PRODUCTION FACTS

Part: End Support Guide Block
Material: Cast Iron
Weight: 290 lbs. Each
Machined On: 36" x 36" x 16' HYPRO Double Housing Planer
Type of Setup: 10 Pieces Aligned in Single Row
No. of Setups: One
Amount of Stock Removed: ¼" to ⅜"
No. of Heads Used: Two Rail Heads
Cutting Speeds: 150 to 180 f.p.m.
Return Speed: 300 f.p.m.
Cutting Tools: Carbide Tipped Tools
Operation: Plane Pads on Sides and Vee Ways
Tolerances: Vees Held Central within .0005"
Machining Time: 6 Hrs., 52 Min.—10 Pieces—Floor to Floor

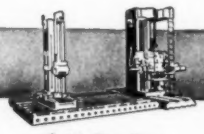


GIDDINGS & LEWIS
FOND DU LAC

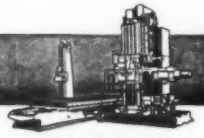
G&L HYPRO



G. & L. Table Type Horizontal Boring Machine



G. & L. Floor Type Horizontal Boring Machine



G. & L. Planer Type Horizontal Boring Machine

. . . these

G. & L. HYPRO PLANING METHODS

Save { *Setup time*... Through "In-Line" Work Mounting
Machining time... With Two Rail Heads Working at Once
Tooling time... With Ample Power for Full Use of Carbide Cutters
Overall time... Through Faster Cutting and Return Speeds

The simplicity of placing ten end support castings "in-line" for simultaneous planing operations illustrates the productive capacity of G. & L. HYPRO Planers. This method of work mounting not only speeds part output, but also insures duplicate operations on all the castings. Multiple mounting of parts on the planer table prorates tool setup over more work pieces and reduces overall setup time to help meet current production demands.

Rail Heads Work Simultaneously

Two rail heads working at once, plane bearing vee ways on both sides of the castings. This arrangement substantially reduces machining time and produces a vee accuracy within .0005". While only the rail heads are used to machine the guide blocks shown, it is practical to use the machine side heads simultaneously with the rail heads. This feature permits greater machine flexibility on different size and shape castings and weldments.

Power for Full Use of Carbide Cutters

G. & L. HYPRO Planers have ample power to use all types of carbide cutters at maximum feeds and speeds. Sturdy structure plus high horsepower input makes it possible to plane from 10 to 300 ft. per minute. Through maintenance of cutter efficiency with high speeds, there is less down-time for tool replacement and regrinding.

Faster Cutting and Return Speeds

On this job, carbide tipped tools are used to plane at 150 to 180 ft. per minute. Return speed is 300 ft. per minute. Combination of these machining factors automatically reduces the overall time required to complete different workpieces.

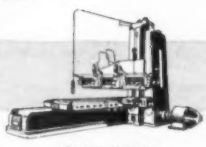
To Increase Production Now

Submit your planing problem to experienced HYPRO engineers. They will gladly advise you how you can remove more metal accurately and fast by planing. Write, wire or phone—there is no obligation.

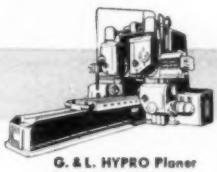
MACHINE TOOL COMPANY

WISCONSIN, U. S. A.

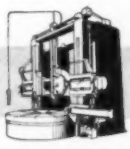
G. & L. HYPRO Double Housing Planer



G. & L. HYPRO Openside Planer



G. & L. HYPRO Planer Type Milling Machine



G. & L. HYPRO Vertical Boring and Turning Mill

DAVIS

Complete Tooling Service

LINK-BELT Silverstreak Silent Chain Drives

deliver full-rated hp

Slip-proof
Slap-proof
Shock-proof

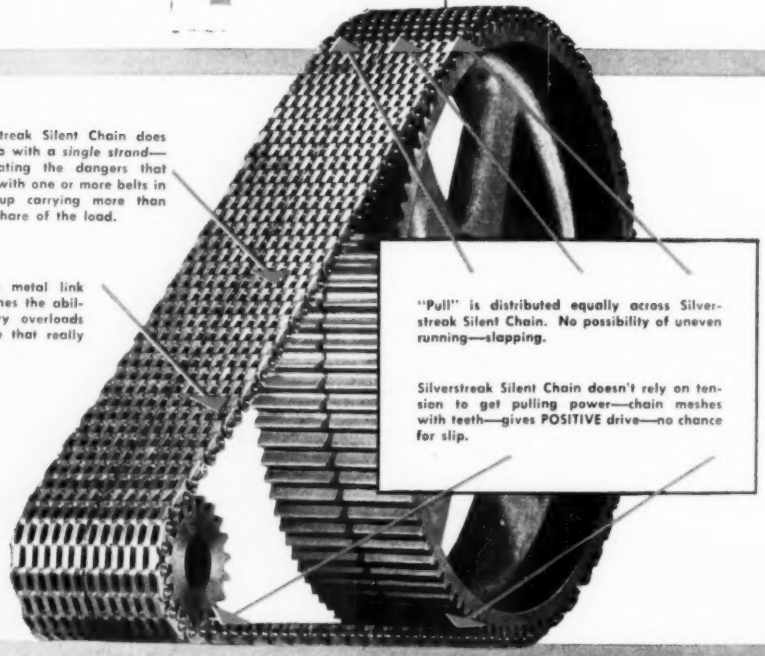
There's no stretch, no slippage with Link-Belt Silverstreak Silent Chain Drives. You're sure of *positive* transmission of every unit of horsepower your motors develop. For every rating, every design has been proven 98.2% efficient.

You conserve space, too—Silverstreaks operate efficiently on extremely short centers. Ratios as high as 10-to-1 are commonly used.

For high speeds—for tough operating conditions—for years and years of trouble-free service—you can't beat Link-Belt Silverstreak Silent Chain Drives.

Silverstreak Silent Chain does the job with a *single strand*—eliminating the dangers that come with one or more belts in a group carrying more than their share of the load.

Husky Silverstreak metal link construction combines the ability to carry heavy overloads with the resilience that really absorbs shock.



"Pull" is distributed equally across Silverstreak Silent Chain. No possibility of uneven running—slapping.

Silverstreak Silent Chain doesn't rely on tension to get pulling power—chain meshes with teeth—gives POSITIVE drive—no chance for slip.

LINK-BELT

SILVERSTREAK SILENT CHAIN DRIVES

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices Factory Branch Stores and Distributors in principal cities.

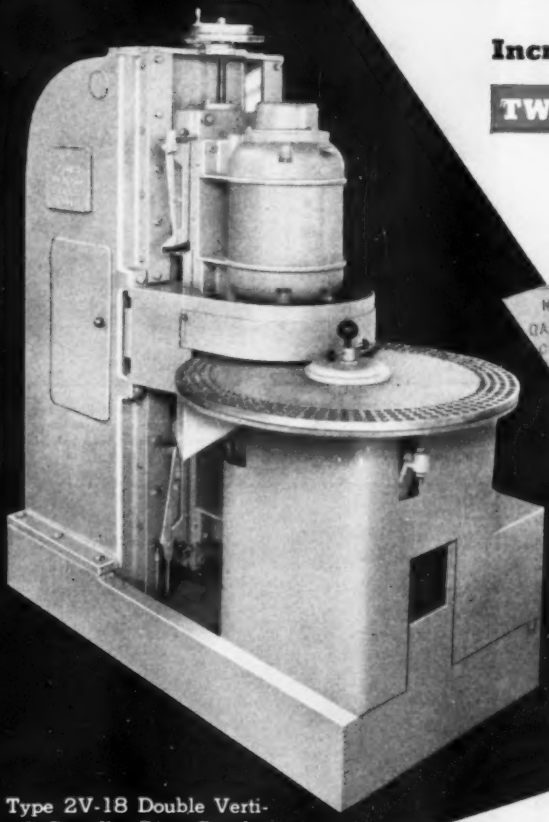
12,299

NEW LOW COST

GARDNER precision disc Grinders

Increase production by grinding

TWO surfaces in ONE operation



Type 2V-18 Double Vertical Spindle Disc Grinder

Horizontal work carrier permits quick, easy loading of small coil springs

For lower production costs investigate

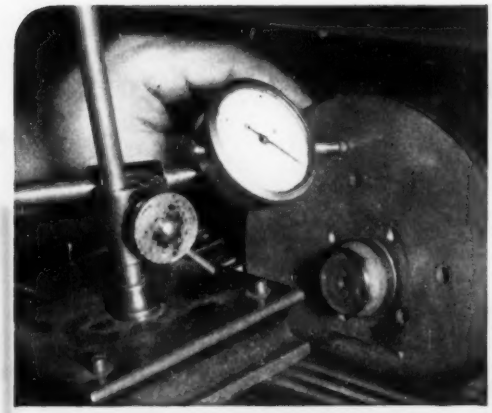
the Gardner TWO in ONE method

WRITE FOR CATALOG!

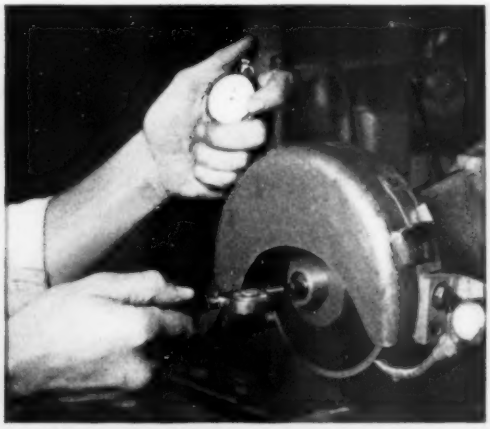
GARDNER MACHINE COMPANY

410 East Gardner Street • Beloit, Wisconsin, U.S.A.

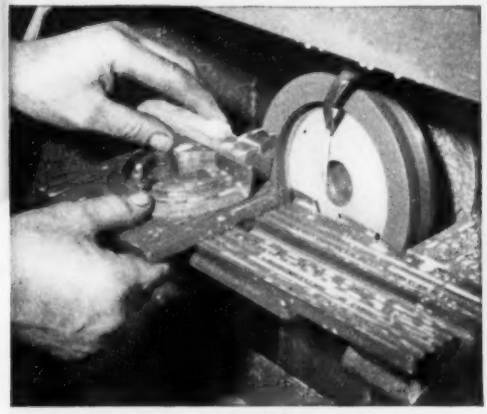
Tips on Diamond Wheel Operation THAT WILL Lengthen Wheel Life and Cut Carbide Grinding Costs



BE SURE SPINDLE AND BACK PLATE RUN TRUE. Before mounting a new wheel, check the spindle and back plate for possible runout. The backs of all Norton diamond cup wheels are precision ground to absolute parallelism with the cutting faces. So, if the spindle and back plate run true, the cutting face of your Norton mounted wheel will also run true.



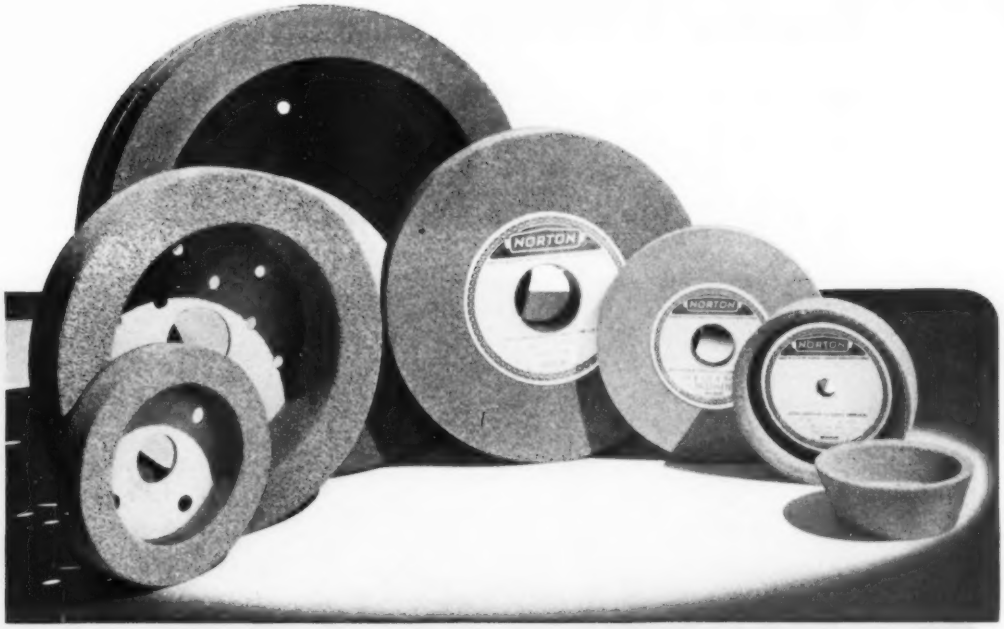
MAINTAIN CORRECT WHEEL SPEED. For best results, run resinoid and vitrified bonded wheels around 3000 surface feet per minute. At lower speeds they cut slower and wear faster. Metal bonded wheels can be operated at speeds as low as 3000 s.f.p.m.



GRIND WET WHEREVER POSSIBLE. Use a thin mixture of any standard water soluble grinding coolant. If stream is not available, use felt wick saturated with mixture of kerosene and light spindle oil or with a water soluble oil.

TRAIN YOUR OPERATORS. In the interests of better grinding practice, Norton maintains a large library of educational films in sound and color. It will pay you to show your own employees the films on carbide grinding and on the care of diamond wheels. They are loaned without charge.

DIAMOND WHEEL INSTITUTE MEMBER



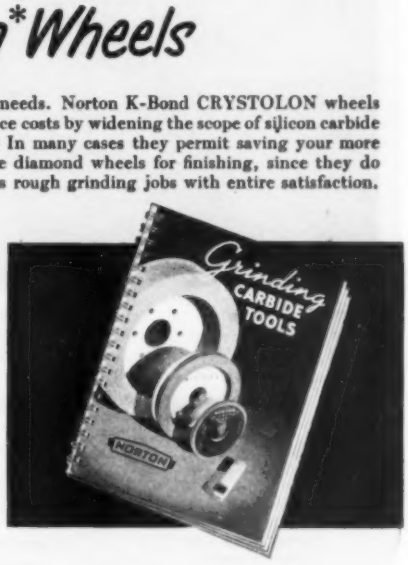
AND ...Investigate The New K-Bond Crystolon* Wheels

Faster, freer cutting silicon carbide wheels with greatly increased uniformity in grinding action. This new vitrified K-Bond can be so accurately controlled that wheels of half-grade increments of hardness are possible — enabling you to "pin-point" specifications to your individual needs. Norton K-Bond CRYSTOLON wheels also reduce costs by widening the scope of silicon carbide abrasive. In many cases they permit saving your more expensive diamond wheels for finishing, since they do numerous rough grinding jobs with entire satisfaction.

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

TAKE ADVANTAGE OF NORTON KNOW-HOW

Your Norton Distributor has much to offer you besides Norton's top-quality products. He is also your contact point for a vast store of knowledge covering every detail of abrasives and grinding — available through Norton Abrasive Engineers located in every industrial center, and through the Norton staff of specialists in Worcester. See your Norton Distributor for the *right* wheels to use for your carbide grinding applications, and ask him for this free 140-page booklet on carbide grinding. Or write direct for FORM 167. NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities.

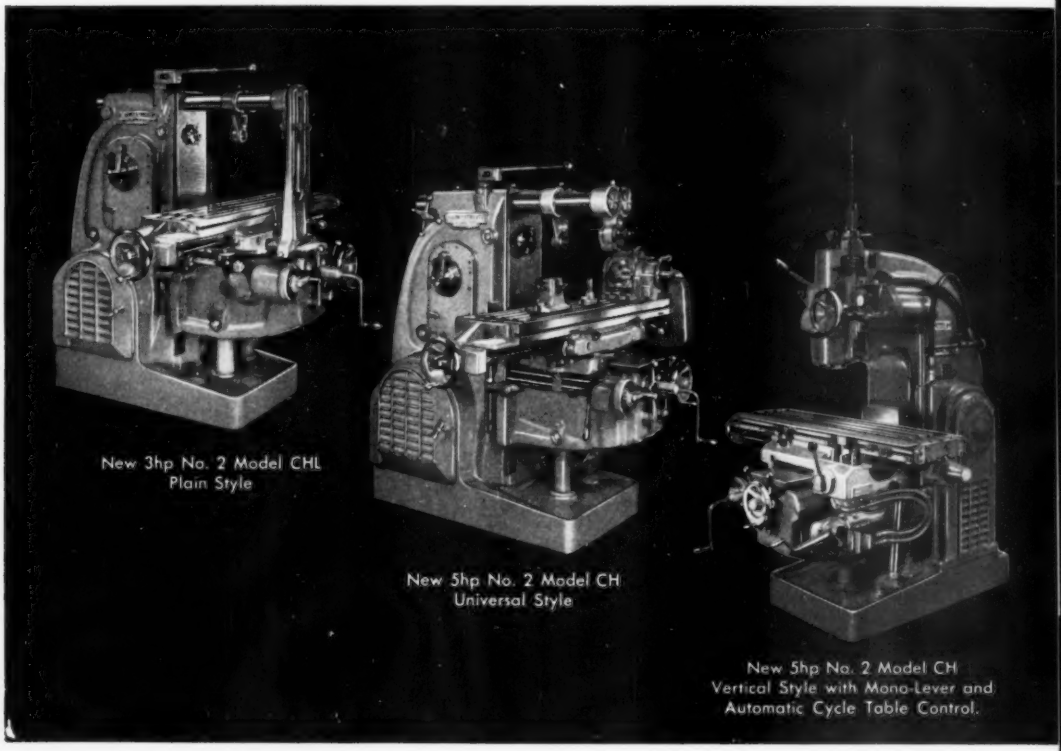


NORTON
ABRASIVES

Making better products to make other products better

Kearney & Trecker Announces . . .

THREE NEW KNEE



New 3hp No. 2 Model CHL Plain Style

New 5hp No. 2 Model CH Universal Style

New 5hp No. 2 Model CH Vertical Style with Mono-Lever and Automatic Cycle Table Control.

The specifications below point up the new larger working ranges of these new Kearney & Trecker machines. You'll find these larger working ranges provide you with new major cost-cutting possibilities for both tool-room and production work — long or short runs. Feeds and speeds listed are standard ranges. Optional ranges are available at extra cost.

Machine	TABLE					SPINDLE	
	Working Surface	Power Feed Travel		Feeds Number & Range	Power Rapid Traverse — " Per Min.	Nat'l Std. Taper	Speeds — Number and Range
		Plain & Universal	Vertical				
No. 1 Model CH Plain, Universal and (swivel head) Vertical	40" x 10½"	Long. 22"	22"	16—⅓" to 32"	150"	40	16 — 25 to 1500 RPM
		Cross 8"	10"				
		Vert. 17"	16"	16—¼" to 16"	75"		
No. 2 Model CHL Plain, Universal and (swivel head) Vertical	46" x 10½"	Long. 28"	28"	16—½" to 32"	150"	40	16 — 25 to 1500 RPM
		Cross 10"	10"				
		Vert. 17"	16"	16—¼" to 16"	75"		
No. 2 Model CH Plain, Universal and (sliding head) Vertical	50" x 12"	Long. 28"	28"	16—¼" to 32"	150"—plain & vert. 100"—universal	50	16 — 25 to 1500 RPM
		Cross 10"	12"				
		Vert. 18"	15"*	16—⅛" to 16"	75"—plain & vert. 50"—universal		

*Add 4" vertical travel for sliding head

TYPE MACHINES

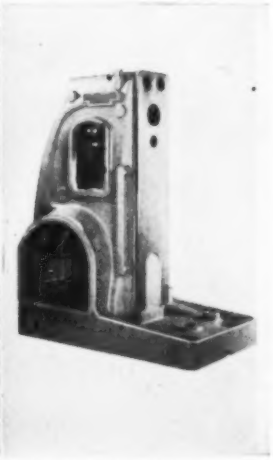
3 and 5 Horsepower

New Kearney & Trecker No. 1 CH, No. 2 CHL and No. 2 CH Milling Machines (Plain Universal and Vertical Styles) have every performance-proven operating and construction feature needed for modern short-run or production milling requirements

Positive locking, rapid-set dials are vapor blasted, for high visibility — avoid costly setting errors.

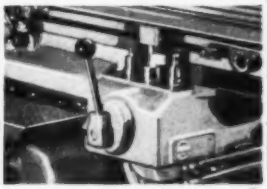
Wider feed and speed ranges meet modern cutting tool requirements — optional ranges available.

Extra large dia. table feed screw and extra long bronze nut with backlash eliminator gives better climb milling performance.



Positive metered pressure lubrication to saddle, table and knee ways and table feed assembly assure greater machine life.

3-bearing spindle design provides solid support for greater rigidity and cutting efficiency using modern cutting tools.



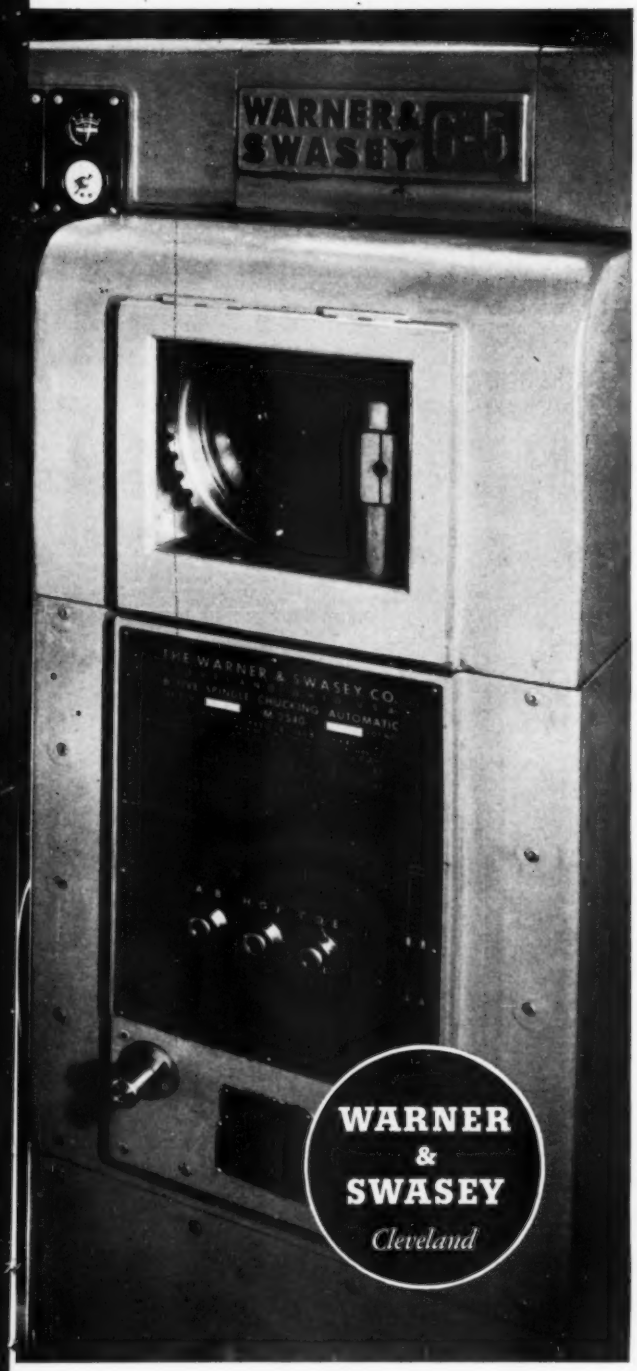
Mono-Lever and Automatic Cycle Table Control (optional) provides high speed production on long or short runs — cuts operator fatigue.

New, heavier columns are scientifically designed to absorb vibration from heavy cutting loads... give greater overall rigidity.

If you're looking forward to modernizing your tool-room or milling machine line — you can't afford to overlook these new 3 and 5hp knee types. They offer you wider working ranges, more practical operating features and heavier construction than any comparable equipment. They've been designed to fully answer today's milling needs — and tomorrow's as well. For complete data on these machines, contact your Kearney & Trecker representative or write direct. Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wis.

KEARNEY & TRECKER
MILWAUKEE
MACHINE TOOLS

YOU CAN MACHINE IT BETTER, FASTER, FOR LESS WITH WARNER



Production up from 80 to 300 pieces per hour

with a Warner & Swasey 5-Spindle Automatic

● In 1940 Badger Meter Manufacturing Company of Milwaukee worked three shifts to turn out their required production. Today they are able to achieve the same output with one shift, using the same floor space for production.

Practically all of these results are due to more efficient machine tools.

For instance, when Badger installed a Warner & Swasey 5-Spindle Automatic Chucking Machine, they had one main purpose in mind—to step up production. It did just that. Output on the standard register housing, used on all Badger meters for liquids, rose from 80 to 300 pieces per hour! In addition, better surfaces and closer tolerances were attained.

Badger, like many a manufacturer who is hard pressed for production during these critical days, has found the Warner & Swasey 5-Spindle Automatic an answer to a prayer. For in addition to improving work quality and stepping up production, it does this with fewer operators.

If these facts hit home, call in your nearest Warner & Swasey Field Representative. He'll be glad to help you boost your man-hour output.

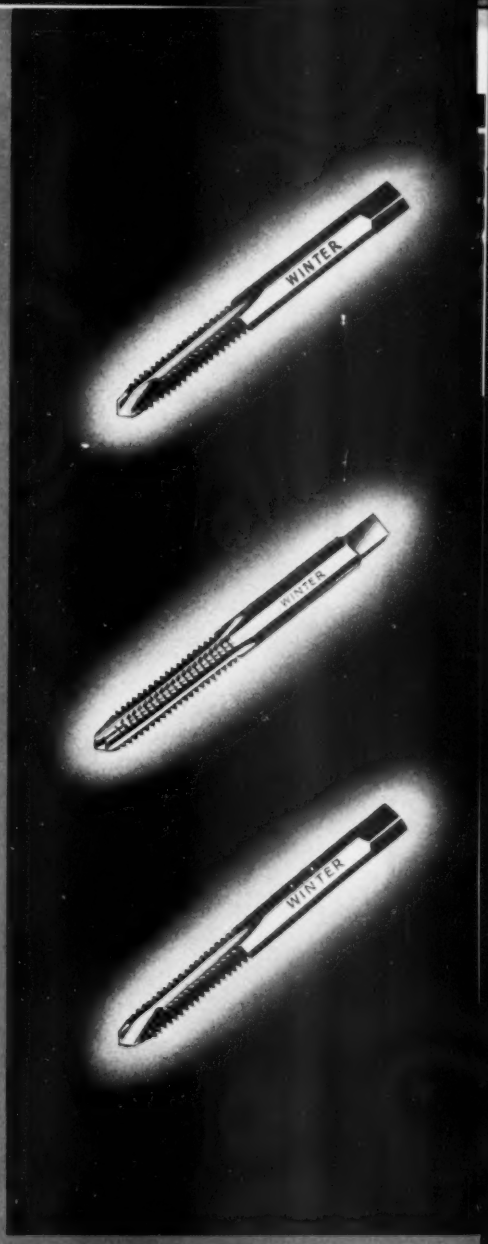
& SWASEY TURRET LATHES, AUTOMATICS AND TAPPING MACHINES

WINTER

BALANCED ACTION

MACHINE SCREW TAPS

SMOOTH, EFFICIENT TAPPING of small diameter holes is assured by Winter Machine Screw Taps. Like all Winter products these small but sturdy taps feature "Balanced Action." Accuracies of diameters, leads, thread forms, chamfers, flute spacings, and flute contours are held to extremely close limits. All Winter "Balanced Action" taps, including chip driver, hand, pipe, nut, tapper, and pulley taps, are stocked by distributors near you, and at factory branches in New York, Detroit, Chicago, and San Francisco. WINTER BROTHERS COMPANY, Division of the National Twist Drill and Tool Company, Rochester, Michigan, U.S.A.



ALWAYS AT YOUR SERVICE

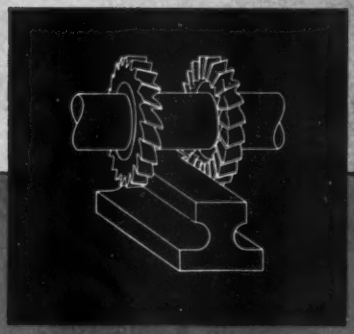
YOUR LOCAL DISTRIBUTOR carries a complete stock of WINTER Taps on his shelves—as close to your tapping problems as the telephone on your desk.

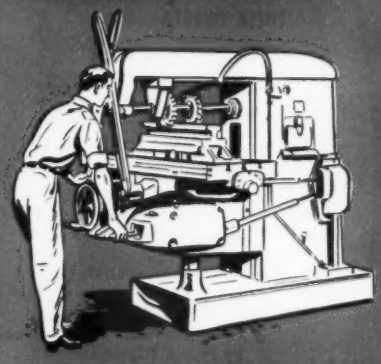
NATIONAL SHEARING ACTION MILLING CUTTERS

TROUBLE-FREE OPERATION, with reduced chatter, under difficult conditions is an inbuilt feature of National "Shearing Action" Milling Cutters. In addition, National "Shearing Action" Milling Cutters give unusually long wear, with top production and performance.

Complete stocks of National cutting tools—twist drills, reamers, end mills, hobs, counterbores, milling cutters, and special tools—are maintained at factory branches in New York, Detroit, Cleveland, Chicago, and San Francisco.

NATIONAL TWIST DRILL AND TOOL COMPANY, Rochester, Michigan, U.S.A.





"CALL YOUR DISTRIBUTOR"

It is NATIONAL'S firm belief, based on long experience, that the local industrial distributor is the one best source for all staple industrial needs —including NATIONAL Metal Cutting Tools.

NATIONAL TWIST DRILL & TOOL ROCHESTER, MICH., U.S.A.

National

A typical short, thin-wall, large diameter workpiece of stainless steel as machined on *T* Lathes at Pratt & Whitney Aircraft Division of United Aircraft Corp., East Hartford, Connecticut. Required tolerances up to .001 are easily obtained.

Turning

...The first really new lathe in over 100 years

The problem of facing, turning and boring thin-wall section work of large diameter and short length has been solved with the radically new Lodge & Shipley ***T*** Lathe developed from a suggestion of Pratt & Whitney Aircraft to meet their special requirements. This 60" right angle chucking lathe eliminates slow and costly machining formerly done on raised or gap engine lathes or vertical boring mills.

Proved to be far faster, more accurate and sensitive and much more accessible, the ***T*** Lathe is twice as compact, costs far less than conventional machines. The bed is in the shape of a "T". The carriage operates at right angles to the centerline of the lathe.

Also designed for the application of Lodge & Shipley COPYMATIC automatic tracer control and variable speed drive if required, the ***T*** Lathe is extremely versatile. If you have thin-walled, short length, large diameter work, it may serve you profitably.

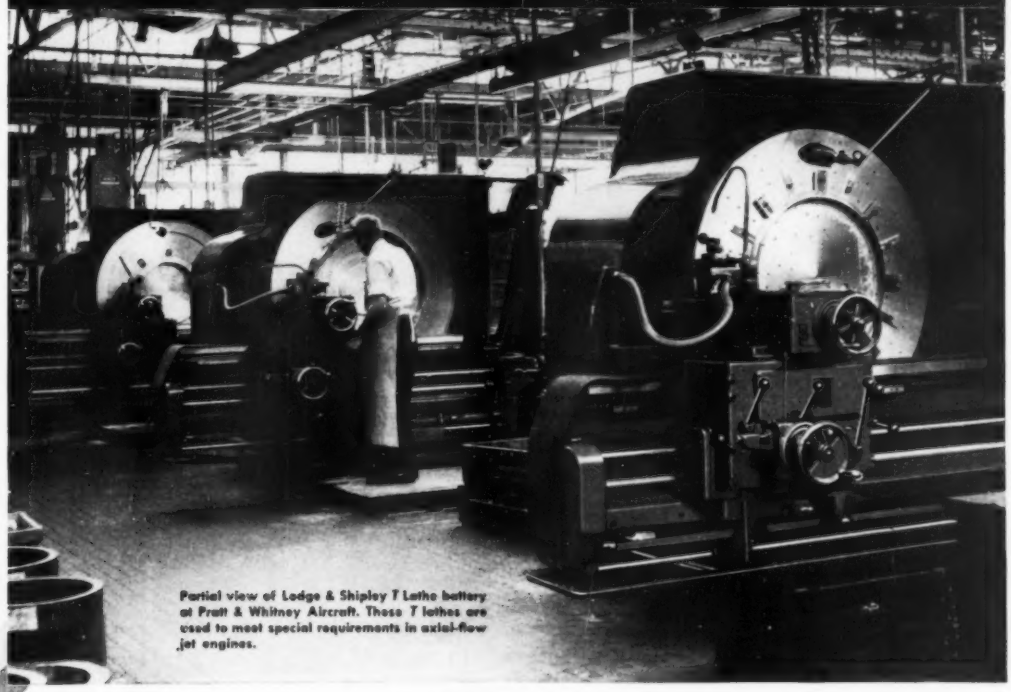
Write for detailed information in Bulletin 209.

ONLY THE *T* LATHE OFFERS THESE OUTSTANDING ADVANTAGES . . .

- Costs less than conventional machines
- Saves 50% or more in floor space
- Makes large, cumbersome engine and raised lathes obsolete
- Offers operating efficiency with centrally located apron controls
- Facilitates loading and unloading by unique *T* Lathe design
- Enables operator to follow cutting tools to fine dimensions

rings around former methods

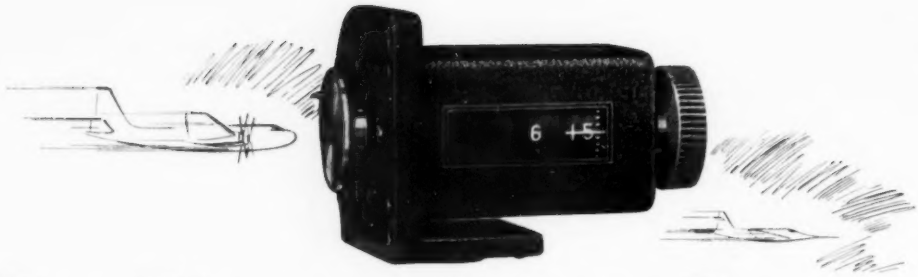
The revolutionary new LODGE & SHIPLEY 60" *T* *Right Angle Chucking Lathe*



Partial view of Lodge & Shipley *T* Lathe battery at Pratt & Whitney Aircraft. These *T* lathes are used to meet special requirements in axial-flow jet engines.

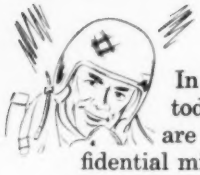
THE **Lodge & Shipley** COMPANY

MACHINE TOOL DIVISION • 3059 COLERAIN
CHOREMASTER DIVISION • 800 EVANS ST.
CINCINNATI 25, OHIO



Plane Pilots... and Electronics Experts...

Everyone Can Count on VEEDER-ROOT



In every arm of the service, today, Veeder-Root Counters are performing countless confidential missions "by the numbers" . . . bringing raid and discomfort to the enemy.

Now if you, too, have a military mission in manufacturing that counts high up in the D-O's . . . and you are in need of some phase of *Count*rol . . . *then let's talk it over.*

VEEDER-ROOT INCORPORATED
"The Name That Counts"
HARTFORD 2, CONN. • GREENVILLE, S. C.
Montreal, Canada • Dundee, Scotland
Offices and agents in principal cities

VEEDER-ROOT COUNTERS *"Count Everything on Earth"*

72 hrs. of heat treatment

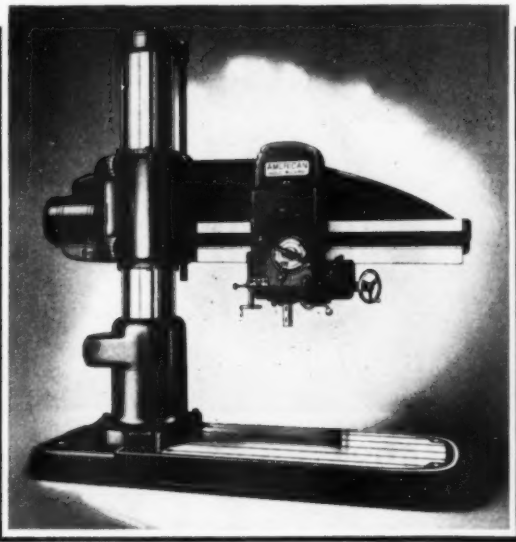
. . . required to produce the ultimate in radial drill spindles

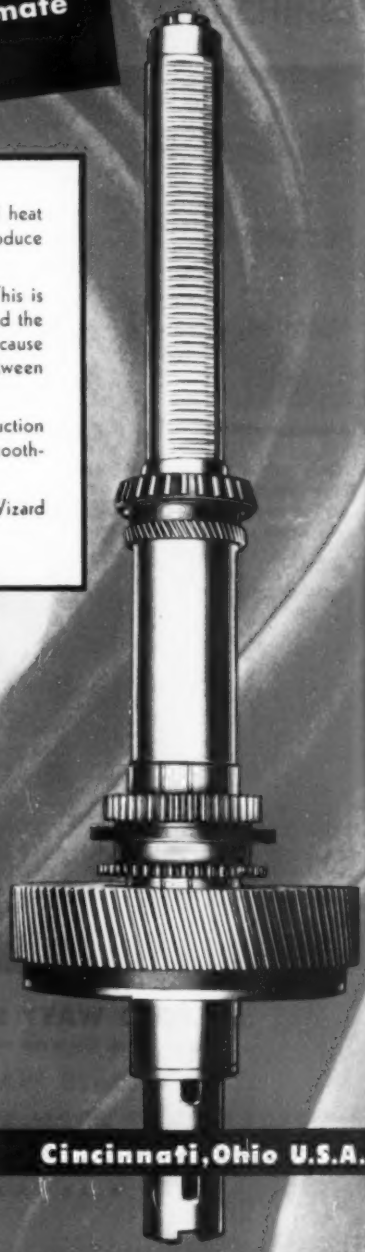
"AMERICAN" Radial Drill Spindles are made of nitralloy. 20 hours of heat treatment from rough to finish, then 72 hours of nitriding are required to produce the wear-resistant spindles used in these radials.

Both the spindles and sleeves are nitrided to 110 degrees scleroscope. This is harder than some grades of cemented carbide. The sleeve is finish honed and the spindle ground and then diamond lapped to a sliding fit in the sleeve. Because of the lack of affinity between these two hard surfaces the clearance between them may be reduced to the very minimum, which in this case is .00025".

This results in the greatest possible stability, resulting in an ideal construction especially for accurate boring operations, which demand a high degree of smoothness and rigidity of the spindle.

This is but one of the super features that make the "AMERICAN" Hole Wizard an outstanding investment.



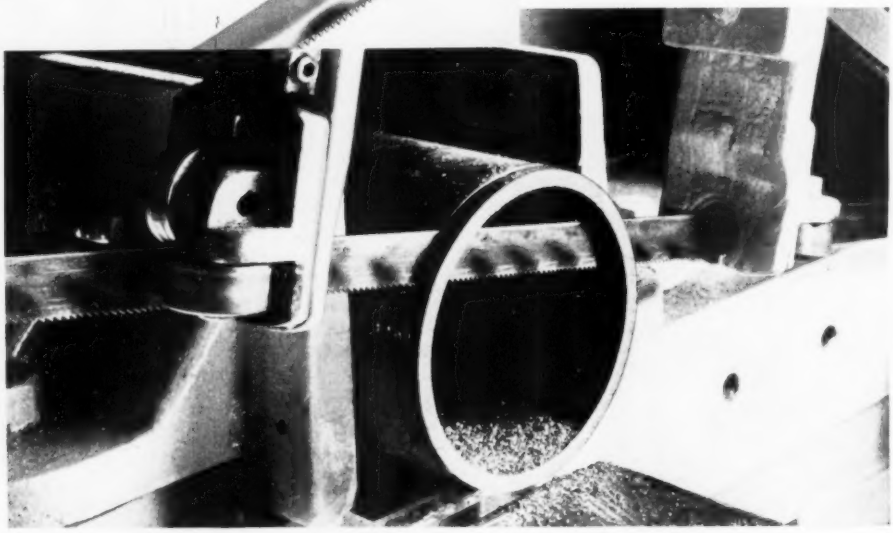


THE AMERICAN TOOL WORKS CO. **Cincinnati, Ohio U.S.A.**

Lathes and Radial Drills

MILFORD METAL CUTTING IS ALWAYS DEPENDABLE,

Superiority in service and product has been MILFORD'S sole aim for 75 years. One superb result of this concentration is the MILFORD Wavy Set band saw blade. Designed for the maximum in long, productive service, this fast, accurate cutter is recorded as cutting up to 50% more metal than many standard raker set blades. Hard, strong teeth, set deep into the blade practically eliminate rippage. Unique Wavy Set — an original MILFORD idea — removes chips from cutting area quickly, makes close-tolerance work easier. And, back of MILFORD Wavy Set is a service organization pledged to render you the same consistently efficient service you expect, and get, with this superior metal cutting blade.



MILFORD WAVY SET IN ACTION . . . As shown above, the MILFORD Wavy Set blade cleans as it cuts. Chips are carried from the cutting area leaving only the blade in contact with the work.

THE HENRY G. THOMPSON & SON CO., NEW HAVEN, CONNECTICUT

SAW BLADE MAKERS FOR 75 YEARS

1876-1951

SERVICE....

READILY AVAILABLE FOR ALL TYPES OF BAND SAW MACHINES

MILFORD SERVES YOU IN YOUR PLANT...IN ITS OWN PLANT . . . .

The above scene is MILFORD service in action. Distributor and MILFORD representative meet with you, ***on your ground,*** to help in solving a particularly difficult metal cutting problem. Call on them. Let them demonstrate their abilities to serve you on your own machines.

MILFORD metal cutting specialists make your cutting problems theirs. Close coordination between distributor, field representative and factory brings your problems to the attention of MILFORD factory technicians. Their single mission is to help you solve them.

This new booklet, "MILFORD METAL CUTTING MANUAL," is full of practical, shop-tested information on metal cutting. Fully illustrated, it is yours from MILFORD to make your metal cutting easier, more economical and more productive. Get your copy from your MILFORD distributor today, or write directly to the factory.

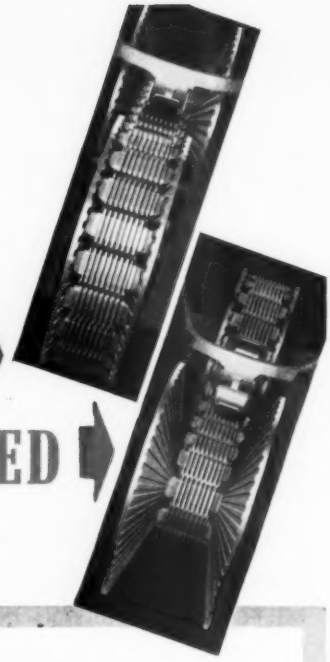
MILFORD

METAL CUTTING SAW BLADES
REZISTOR & DUPLEX HACK SAW BLADES
PROFILE & BAND SAW BLADES

Only **the P.I.V. variable speed drive has tooth-grip action... from**

MAXIMUM SPEED to MINIMUM SPEED

with an infinite number of positive settings



Only Link-Belt's P.I.V. delivers *positive*, stepless speed changing independent of friction . . . because only Link-Belt's P.I.V. has the self-tooth-forming chain that makes this possible. Your nearest Link-Belt branch office can show you how to increase the efficiency and flexibility of your machines, and supply complete information —covering pre-selection of the right P.I.V. variable speed transmission for your needs, horsepower ratings, arrangements and engineering data.

LINK-BELT

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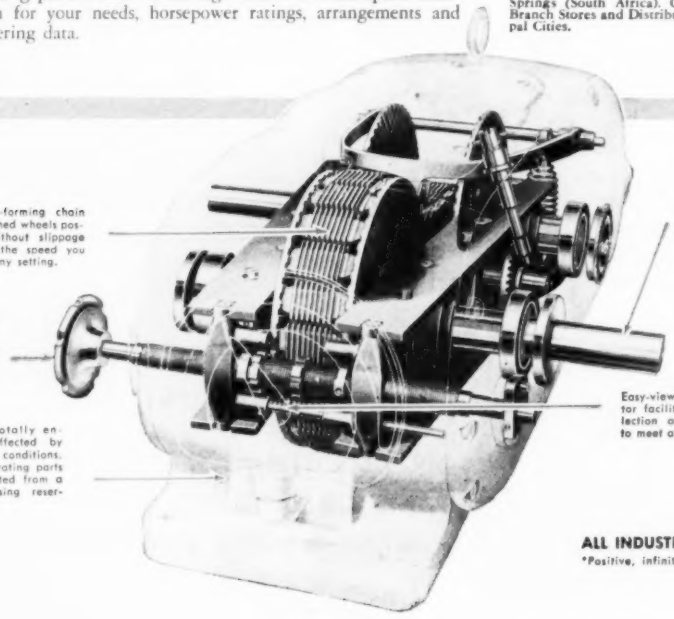
LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices, Factory Branch Stores and Distributors in Principal Cities.

12.200



Self-tooth-forming chain grips toothed wheels positively without slippage — gives the speed you need at any setting.

An infinite number of positive, stepless speed adjustments may be made with manual, electric, pneumatic or hydraulic controls.

All-metal, totally enclosed — unaffected by atmospheric conditions. All vital operating parts splash lubricated from a common housing reservoir.

You can get minute speed changes and maintain them accurately while operating under full load.

Easy-view speed indicator facilitates speed selection and adjustments to meet all requirements.

ALL INDUSTRY USES P.I.V.*

*Positive, infinitely variable

Productivity
...from Brown & Sharpe

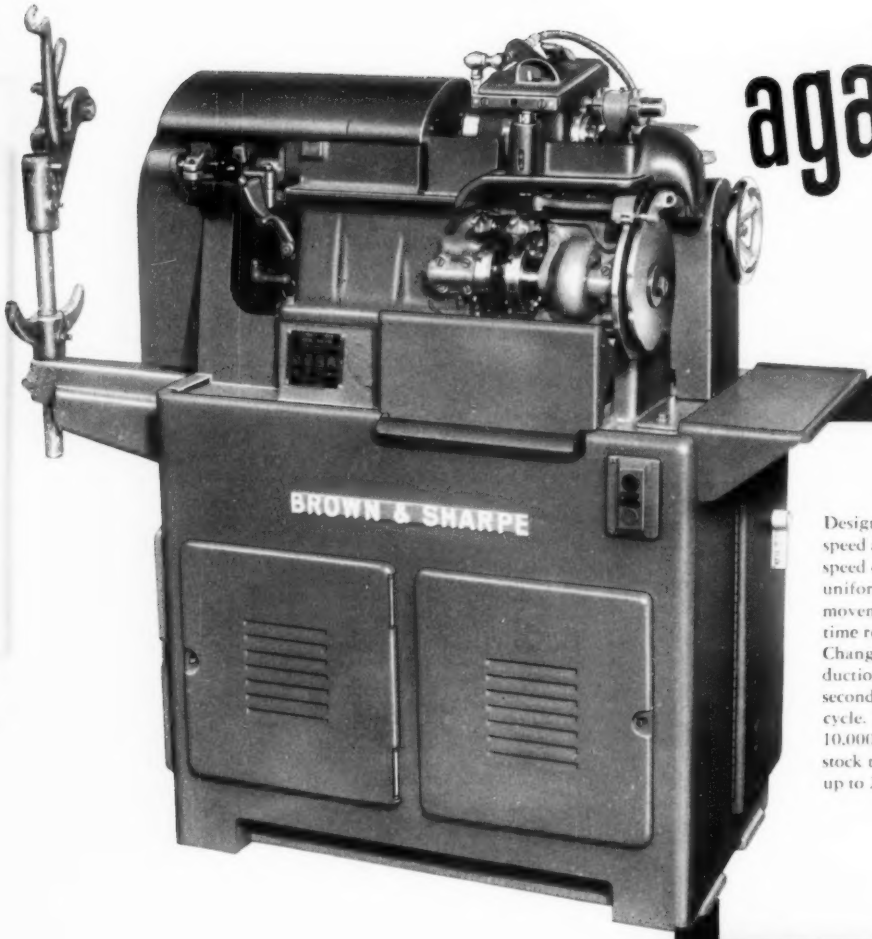
fine tools that promote consistent accuracy

Even the most highly skilled machinist finds it easier to maintain high production with consistent accuracy when equipped with quality tools. The added assurance which they afford permits faster precision work with less fatigue.

Brown & Sharpe supplies a complete line of Machinists' Tools that represent the fullest measure of sound design, precision manufacture and proven reliability. They are universally recognized by machinists as the criterion of quality tools.

Write for complete small tools catalog

FORESIGHTED

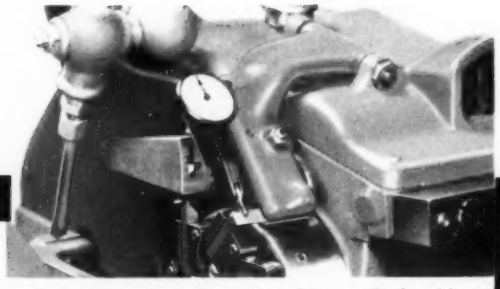


against

Designed throughout for speed and accuracy. Constant-speed drive shaft insures uniformly rapid automatic movements, regardless of time required to make part. Change gears provide production rates from 3 to 30 seconds for one piece per cycle. 16 spindle speeds from 10,000 to 910 r.p.m. Takes stock to 1/4" dia. and turns up to 2 7/8" length.

PROTECTION

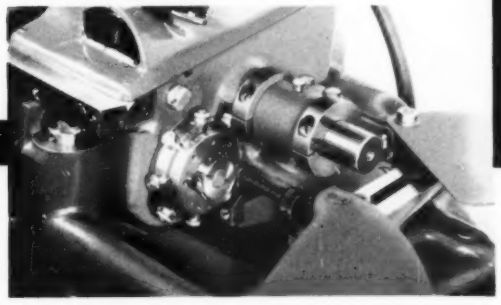
Skilled-Operator Shortage...



Tool Adjusting Dial Indicator on swing-arm affords quick, accurate replacement of tool . . . saves time and cut-and-try spoilage.

Circular-Formed, Single-Point Tools are dressed by full-length surface grinding across the top . . . can be quickly and accurately resharpened.

Individual Micrometer Stops for each tool simplify accurate duplication of parts without machining cams to extremely close accuracy.



Brown & Sharpe Automatic Pinion Turning Machine

equips you for high output, accurate duplication . . . without expert pinion turning specialists!

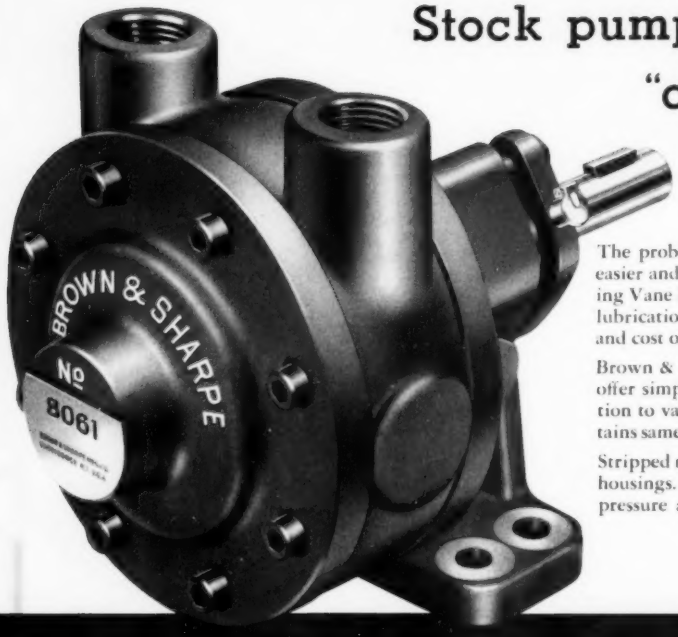
With defense orders now adding to normal demands for staff and pinion work, the Brown & Sharpe Automatic Pinion Turning Machine represents one of the soundest investments many manufacturers can make.

This modern automatic single-point turning machine dependably meets all close-tolerances and fine-finish requirements of military and civilian assemblies such as clocks, instruments, fuses and timers. What's more, accurate operation with exceptionally high uniformity can be maintained without highly skilled operators!

Improved design features that make the Brown & Sharpe Automatic Pinion Turning Machine practically "foolproof" include: exclusive circular-formed single-point tools; built-in tool resetting indicator and tool centering gage; individual micrometer stops for all 8 tool positions; control of all operations by two simple disk cams.

Write for detailed specifications.

Stock pumps with "custom-made" performance

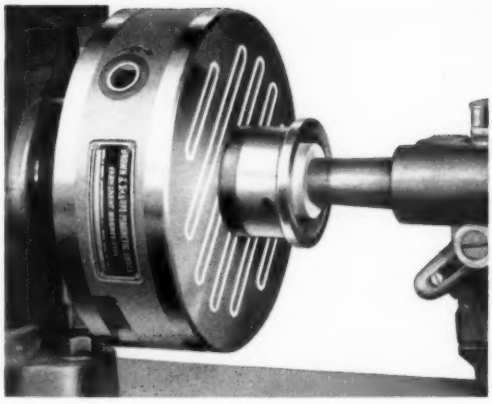


The problems of new machine design can be made easier and simpler by using Brown & Sharpe Reversing Vane Pumps as original equipment for automatic lubrication. Their adaptability saves the time, trouble and cost of specially-designed pumps.

Brown & Sharpe Automatic Reversing Vane Pumps offer simplified design that assures easy accommodation to varied applications. Automatic feature maintains same direction of flow when rotation is reversed.

Stripped models also available both with and without housings. Three sizes: $2\frac{1}{2}$, 5 and $11\frac{1}{2}$ gpm at 0 lbs. pressure and at 1140 r.p.m. Write for catalog.

Time-saving chucks for grinding and light machining



Work goes on and off the machine in minimum time with Brown & Sharpe Rotary Model Permanent Magnet Chucks. Quick-acting controls provide convenient, instant holding and release. Work may be held as long as desired without heating or danger of power interruption. For wet or dry grinding and light machining.

Brown & Sharpe Rotary Model Permanent Magnet Chucks cost nothing to operate . . . last indefinitely. Available in 5", 7", and $9\frac{1}{4}$" diameters. Complete line also includes Rectangular Models in 6 sizes from $2\frac{7}{16}$" x $5\frac{1}{4}$" to $12\frac{1}{8}$" x 36". For sale only in U.S.A. and its territories. Write for complete catalog.

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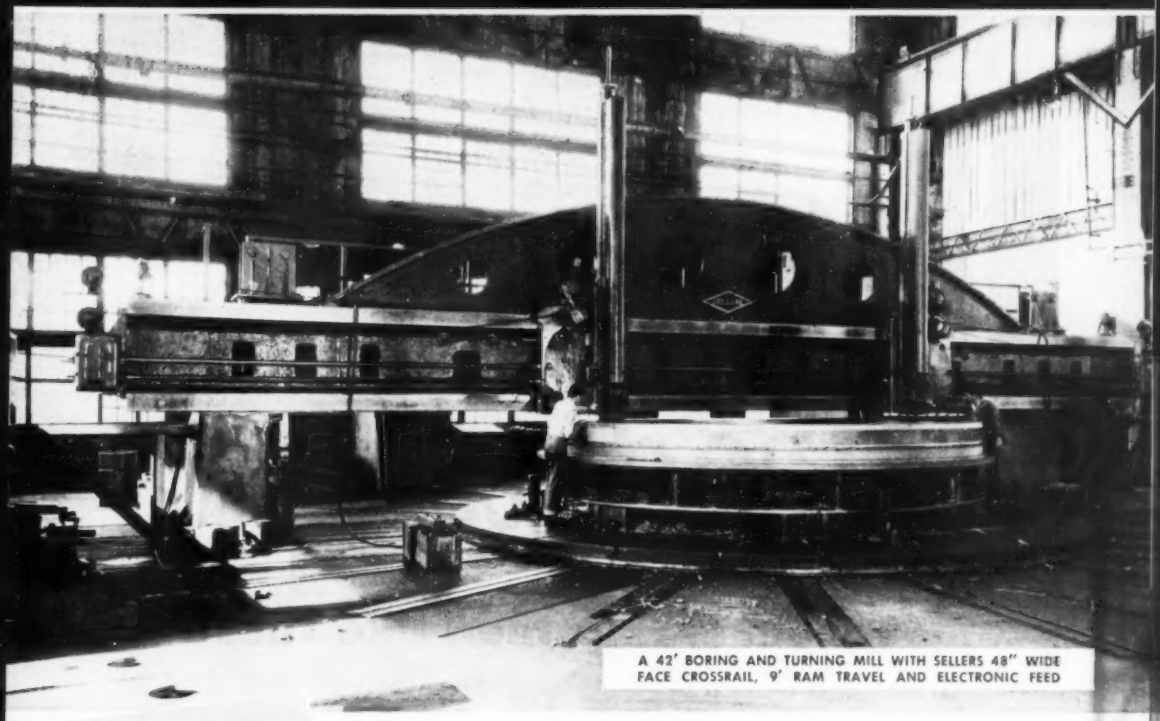
B·S

Milling Machines • Grinding Machines • Screw Machines • Cutters • Machine Tool Accessories
Machinists' Tools • Electronic Measuring Equipment • Johansson Gage Blocks • Permanent Magnet Chucks

BROWN & SHARPE MFG. CO., PROVIDENCE 1, R. I., U.S.A.

For your big jobs . . .

CONSOLIDATED HEAVY DUTY BORING AND TURNING MILLS



A 42' BORING AND TURNING MILL WITH SELLERS 48" WIDE FACE CROSSRAIL, 9' RAM TRAVEL AND ELECTRONIC FEED

Among Heavy Machine Tools built by Consolidated are . . . .

LATHES
BORING MILLS
DRILL PRESSES
MILLING MACHINES
BORING MACHINES
COLD SAW MACHINES
BORING, DRILLING AND MILLING MACHINES
DRILL AND TOOL GRINDERS
PLANERS
SLOTTERS
RAILROAD SHOP TOOLS
AUTOMOTIVE TOOLS
AND OTHER SPECIAL MACHINES

With the Sellers Electronic Feed* to the crossrail heads, the feed can be varied in fine increments while the tool is cutting. This is of primary importance when using carbide tools as it insures getting maximum efficency from both tools and machine. The amount of feed is controlled by the operator while watching the tool from the head platform, which is usually provided on this type of machine but not shown above. He is not obliged to go to the end of the cross-rail to change feeds, nor must he stop the table. All controls are by push buttons conveniently located at the point where the tool is working.

Consolidated Heavy Duty Vertical Boring and Turning Mills are of rugged uncomplicated design particularly adapted to heavy continuous operations requiring a high degree of accuracy combined with power. Among outstanding features that make them leaders in their field, is their type of table mounting which insures positive concentricity. Built in a range of sizes from 100" up to any requirement. Full information covering any size will be furnished upon request.

*Patents Pending

BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848

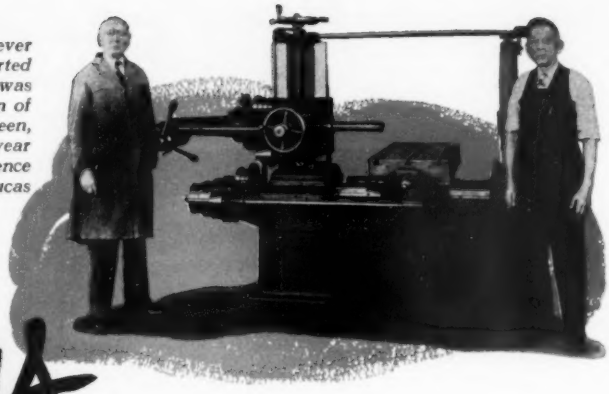
BETTS • BETTS-BRIDGEFORD • COLBURN • HILLES & JONES • MODERN • NEWTON • SELLERS

CONSOLIDATED MACHINE TOOLS

CONSOLIDATED
MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

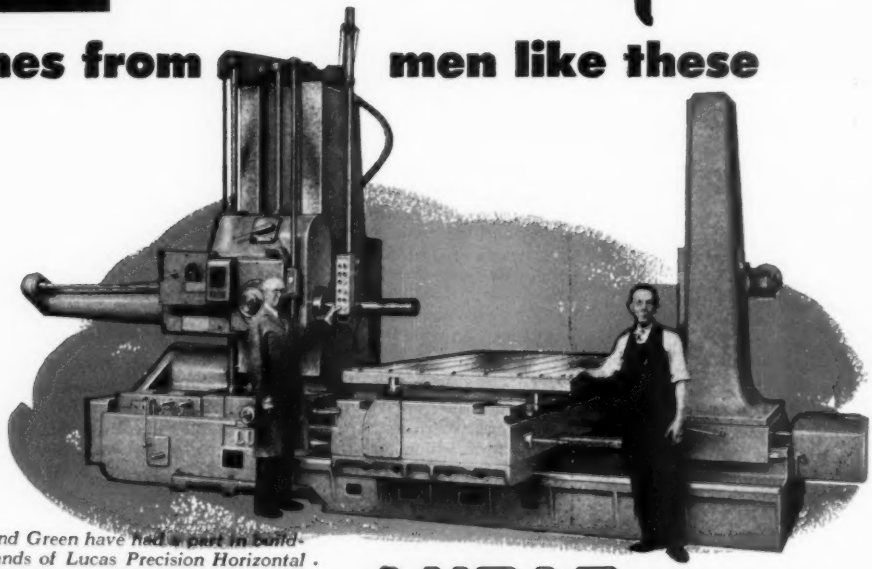
Here is the first Lucas Machine ever built. When Ed Wilde (left) started working at Lucas, this machine was brand new. Today Wilde is foreman of our Lathe Department. H. T. Green, Tool Room foreman joined us a year later. They have a combined experience and know how of 99 years on Lucas Machines.



Lucas Leadership

31 YEARS LUCAS OF CLEVELAND ONE PRODUCT

comes from men like these



Wilde and Green have had a part in building thousands of Lucas Precision Horizontal Boring, Drilling and Milling Machines. They represent the concentration on the development and improvement of a single product over half a century that has kept Lucas far ahead of the parade.

LUCAS *Precision*

HORIZONTAL BORING, DRILLING AND MILLING MACHINES

LUCAS MACHINE DIVISION • THE NEW BRITAIN MACHINE CO. • CLEVELAND 8, OHIO

A MESSAGE TO AMERICAN INDUSTRY

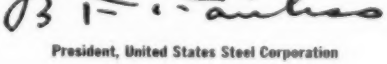
"This is more than a shortage . . . this is an emergency.

Every pound of your scrap is needed, NOW !"

"THE STEEL INDUSTRY is currently operating at more than 100% of rated capacity—turning out well over 2 million tons of steel per week. This record high production—every ton of which is in urgent demand—cannot be kept up unless we get more scrap from every potential source. For without your scrap we cannot produce enough steel. Today, every ton of steel turned out requires a half a ton of scrap for its production. That's why scrap—more scrap—is so urgently needed, and needed right away.

"The fact we have to face today is that steel mills are operating on a hand-to-mouth basis as far as scrap is concerned. Some mills are working on only a two-day supply of scrap. We already have had to shut down steel-making furnaces for lack of scrap.

"That's why we are asking you to strain every effort to get more scrap out of your plants and yards and on its way to the mills . . . to search out the scrap that doesn't come to market in normal times. You'll find this "dormant" scrap in obsolete equipment, tools and machinery that you haven't used for years . . . overlooked in your storage sheds . . . or rusting away in a junk pile in some forgotten corner. It's there. Turn it in at once—*so we can turn out the steel you need.* We can't do it without your help."



President, United States Steel Corporation

USS

1-1182

UNITED STATES STEEL

Take this Straight
from the
FEED-BAG!...
HORSE
HORSE

Yes, it's good horse-sense to buy Morse! For every day in the Morse plant, Morse Milling Cutters turn out thousands of cutting tools, made of the toughest tool steels. And this means that *you* . . . when *you* buy Morse Cutters . . . can know for sure that you're buying *Top Quality* that lasts longer . . . cuts smoother . . . *and delivers more pieces per grind.*

So just keep in mind that if you want Morse Quality and productivity, *you've got* to buy Morse Milling Cutters. And your Morse-Franchised Distributor is stocked to serve you *now* with the right cutters for your job . . . whether they be Angle, Form, Woodruff Keyseat or Saws for slitting and slotting . . . regular or Electrolized. Call your Morse-Franchised Distributor for *the cutters that cut deepest into milling costs.*

Morse Twist Drill & Machine Company
NEW BEDFORD, MASS.
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Warehouses in New York, Chicago, Detroit, Houston, San Francisco

MORSE
Cutting Tools

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CONTROL OF QUALITY
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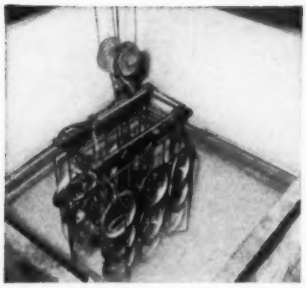
WITH LARGE PARTS . . . OR SMALL

Vapor Degreasing GIVES YOU

ONE-STEP CLEANING . . . THAT'S FAST AND TROUBLE-FREE

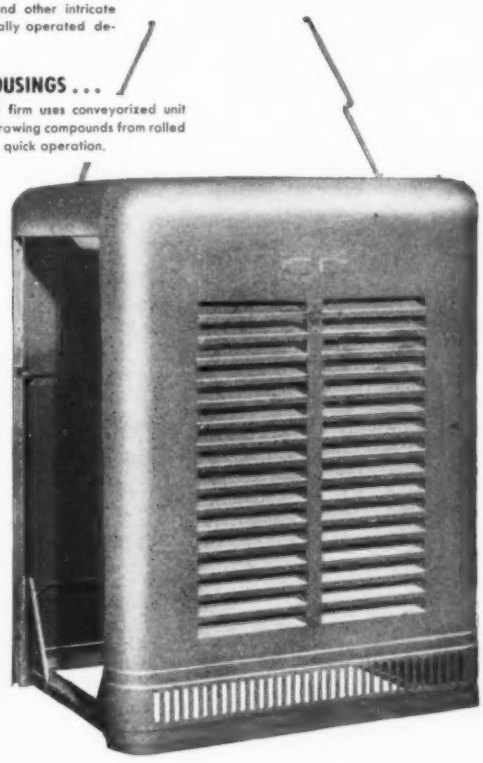


FOR PRECISION PARTS . . .

Aircraft engine manufacturer cleans up to 7,000 pounds of gears, brackets and other intricate parts per hour in this manually operated degreaser.

OR HEAVY HOUSINGS . . .

Heating-equipment firm uses conveyorized unit to remove oil and drawing compounds from rolled steel casings in one quick operation.



Whether your cleaning problem concerns tiny washers or giant housings, consider vapor degreasing with Du Pont Trichlorethylene.

Thousands of manufacturers are now using this fast, safe, efficient method of metal cleaning. It's easy to install, easy to operate, easy to maintain . . . especially applicable for plants that are expanding production or doing metal cleaning for the first time.

You, too, can keep cleaning costs down and production up with vapor degreasing.

Du Pont Degreasing Solvents have been widely used for many years and are available under various trade marks, such as "Triclene" D.

These solvents are stable . . . stand up against contaminating and destructive materials . . . are the best yet developed by Du Pont for metal degreasing.

non-flammable

DU PONT SOLVENTS for VAPOR DEGREASING

SOLD NATIONALLY THROUGH DISTRIBUTORS

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BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

Mail the coupon below for more facts on vapor degreasing.

E. I. du Pont de Nemours & Co. (Inc.)
Electrochemicals Dept., Wilmington 98, Del.

Please send me detailed information on Vapor Degreasing: applications, advantages, equipment used, and Du Pont solvents available. We are interested in cleaning _____ products.

Name _____ *Position* _____

Firm _____

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City _____ *State* _____

A Complete Range of

NATCO OFFERS YOU machines ranging from small, fast, light-sensitive multi-drillers and tappers to large automatic processing machines . . . from single spindle to an unlimited number of spindles, from one direction to any number of directions, vertical, horizontal or angular, special or standard . . . and operations including drilling, boring, turning, facing and tapping ranging from 1/16" drill to 14" or larger bore . . . working in iron, steel, bronze, aluminum, wood and plastic.

Four examples of modern NATCO Machines are shown here:

NATCO B308 BORFACE Machine

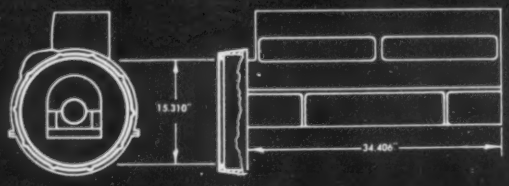
PART—AUTOMOTIVE CYLINDER BLOCK

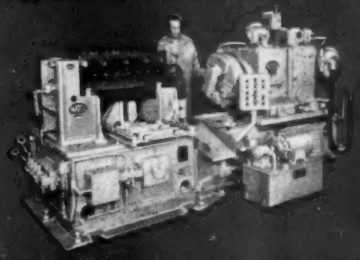
OPERATIONS

Rough and finish bore the flywheel opening, and semi-finish and finish face the end using cross feed tools.

PRODUCTION

—Approximately 45 parts per hour.





NATCO 2 Way Horizontal HOLETAPPER

PART—AUTOMOTIVE CYLINDER BLOCK

OPERATIONS

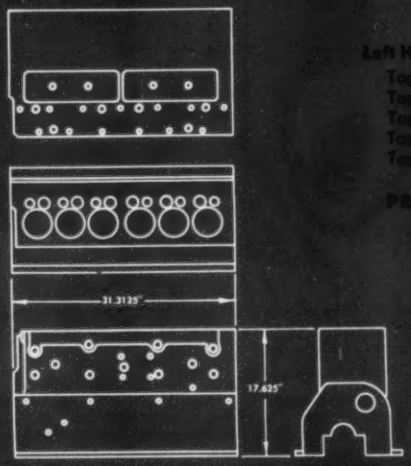
Left Hand Head

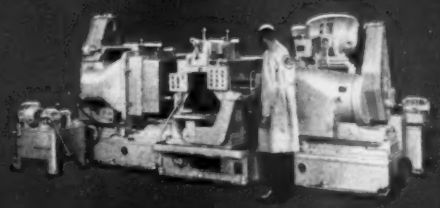
Tap 11 holes to ⅜" pipe tap
Tap 4 holes to ¼" pipe tap
Tap 2 holes to ⅝" pipe tap
Tap 5 holes to ⅜-16 tap
Tap 1 hole to ¼ N.P.T.

Right Hand Head

Tap 13 holes to ⅝"-14 tap
Tap 6 holes to ⅜" pipe tap
Tap 4 holes to ⅝"-13 tap
Tap 1 hole to ¼" pipe tap

PRODUCTION—approximately 20 parts per hour.





NATIONAL AUTOMATIC TOOL COMPANY, INC., Richmond, Indiana

Sizes and Capacities...

NATCO H5 Multiple Drilling and Tapping Machine

PART—TYPEWRITER SEGMENT BAR

OPERATIONS

Set Up #1

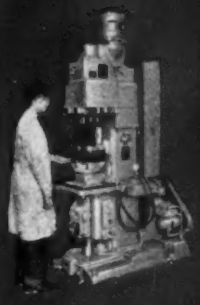
Position #1—Remove and load one part.
Position #2—Drill 4 holes #39 (.0995) diameter.
Drill 2 holes #2 (.2211) diameter.
Position #3—Ream 2 holes .235 diameter.

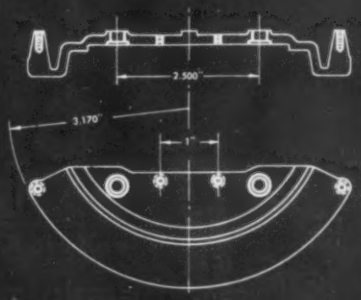
Set Up #2

Position #1—Remove and load one part.
Position #2—Tap 4 holes with #5-40 tap.
Position #3—Idle.

PRODUCTION

Set Up #1—Approximately 225 parts per hour.
Set Up #2—Approximately 320 parts per hour.



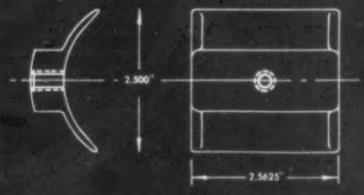


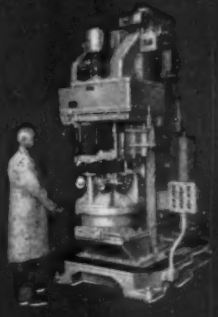
NATCO C2A Vertical HOLESTEEL Machine

PART—POLE PIECES FOR GENERATOR

OPERATIONS

Position #1—Remove and load two parts.
Position #2—Drill one hole in each part for 8 x 1.25 mm tap.
Position #3—Chamfer one hole in each part.
Position #4—Tap one 8 x 1.25 mm hole in each part.





PRODUCTION

approximately 270
Pole Pieces per hour.

SEND US YOUR drilling, boring, facing and tapping problems . . . our engineers have the solution.

Golden Anniversary

NATCO

1901 1951

Call a Natco Field Engineer

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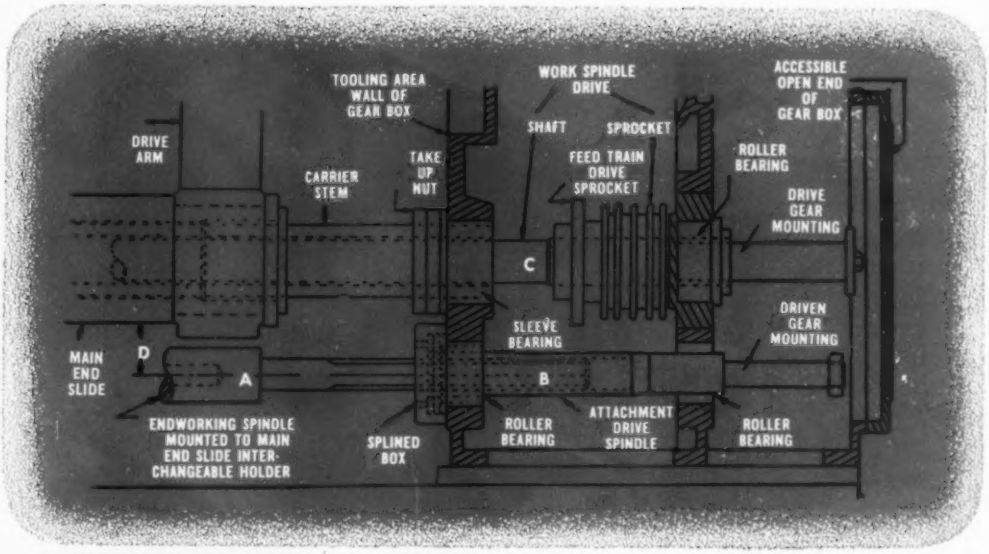
GISHOLT
whatever
your turning problems
may be...
GISHOLT
is ready to help you increase production
GISHOLT MACHINE COMPANY
MADISON 10, WISCONSIN
THE GISHOLT ROUND TABLE
represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.
GISHOLT
TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES



BEWARE OF THE BAR IN BARGAIN

With manufacturing costs much the same the country over, the purchase prices of various brands of a given type of machine tool should be about equal for equal value. Healthy competition tends to level out prices.

All of the best facilities of the highest priced machine may not be needed, and should not be expected of the lowest priced machine. The value of any brand depends on how well its facilities meet the particular needs of the individual plant.

Of all required facilities, those of low-cost operation and maintenance are universally considered important. A machine without them is a BAR to any GAIN at any PRICE.

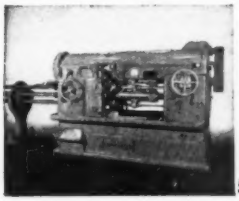
An example of **LOW-COST OPERATION AND MAINTENANCE FACILITY** is the **EXCLUSIVE** Conomatic **"ALL POSITION" END ATTACHMENT**, which has:

1. **Direct Drive to ANY Rotating Tool, in ANY or ALL SIX, Main End Slide Positions. Solid Tapping in ANY THREE Positions on ONE Set-up. Die Head Swing, D, clears COLLET CAPACITY in ANY Position.**

The above drawing shows Endworking Spindle, A, in a Main End Slide Position of a 1½" SIX SPINDLE Conomatic. Its splined shaft is rotated by the Attachment Drive Spindle, B. The drive from the Work Spindle Drive Shaft, C, is indicated. The Spindle, A, rotates in its bearing in an interchangeable Holder mounted to the Main End Slide, whose travel it may take. Three levers and cams offer independent travel to any three Endworking Spindles per single set-up.

2. **Accessible OPEN-END Application and INTERCHANGEABLE Attachment HOLDERS. Selective Speeds and Feeds.**

Six Attachment Drive Spindles may be applied to one set-up. Two are machine equipment. There is drive facility for 168 Speeds between 132 and 6158 RPM for drilling, boring, etc. Std. Drive Gears offer 10 Threading Speed Ratios.



Buyer's Comparison Chart will guide you to full information

A Comparison of ALL Automatics is in Favor of Cone

Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC.
WINDSOR, VT., U.S.A.

Murderous shock duty is imposed on the motor on this log barker. Conventional cast motors broke shafts, feet, brackets. The steel frame Life-Line stands up . . . has reduced outages to zero . . . saved costly replacement.

FOR THE BEST DESIGN

USE Life-Line

Other makes of starters, previously tried, couldn't "stand the gaff" on this cinder block-making machine. Here, where vibration is severe, standard Life-Linestarters performed without fail. Operation requires opening and closing of starter over 240 times every hour.

Jarred?

These two can take slam-bang abuse

How many times does your design call for something extra in a control . . . or a motor? Extra ability to withstand vibration, shock, physical impact, for example. Here's a pair—matched in ability to meet these conditions.

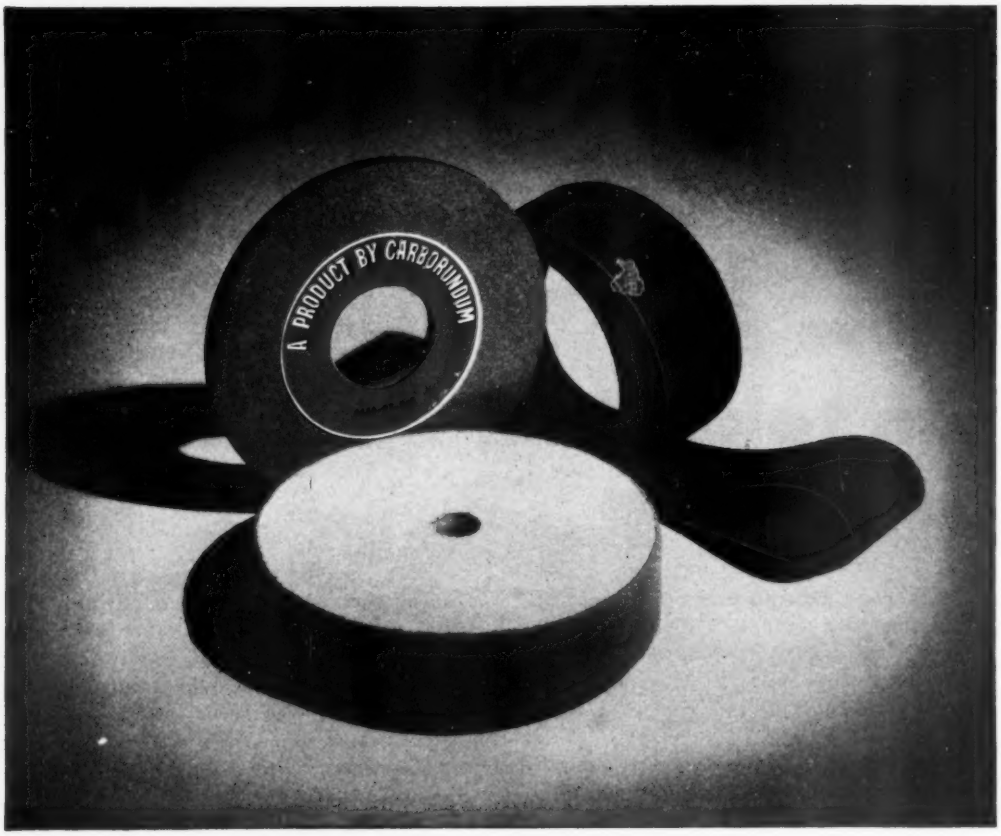
Take the Life-Linestarter.® Vibration or accidental impact does not cause false operation with resultant contact pitting. That's because it employs an inverted, clapper-type design in which a movable element is pulled against a stationary magnet. Contact opening does not depend on gravity. Positive kickout spring speeds operation.

Now, the Life-Line motor. The severe stresses of heavy loads which must be transmitted through the motor frame and feet are easily withstood by the Life-Line steel frame. There's no distortion of laminations. What's more, steel adds strength without adding bulkiness. In fact, Life-Lines are as much as ⅓ smaller for the same frame size. You save space, weight; you gain strength.

Remember it costs no more to get Life-Line performance. Specify this pair on your future designs. More information? Simply call your Westinghouse representative. He'll give you complete facts . . . help you with any problems. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-21626

YOU CAN BE SURE . . IF IT'S
Westinghouse

Life-Line
MOTORS and CONTROLS



You can't miss...

Not when you pick a product by CARBORUNDUM. A complete line of all abrasive products is your assurance of selective product application. You match the best method with the right product from the complete standard line by CARBORUNDUM.

Thus, the recommendation of an experienced CARBORUNDUM salesman or distributor is not merely helpful...it's impartial. These men have no reason to offer anything but the best method and product for your job...they sell the only complete line of products identified by the best known name in abrasives.

This experience in all abrasive products and methods is an excellent proving ground for new products and methods. Ask your CARBORUNDUM representative about them. You can't miss.

Only CARBORUNDUM

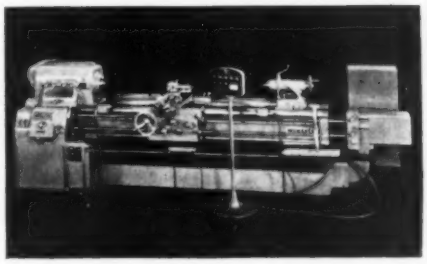
TRADE MARK

makes ALL Abrasive Products...to give you the proper ONE

"Carborundum" is a registered trademark which indicates manufacture by The Carborundum Company, Niagara Falls, N.Y.

TURN TO MONARCH

MOTOR-TRACE TURNING



PRINCIPAL FEATURES

- Completely automatic cycle enables one operator to handle two machines on most work and assures perfect duplication of size from piece to piece.
- Saves time on lots as small as two or three pieces because total setup never requires more than fifteen minutes, often much less.
- On straight, multiple diameter work, provides accurate size control without tracer being in constant contact with a template. This allows use of micrometer heads, gage blocks or a simplified form of flat template.
- Application does not reduce normal capacity of lathe which may be converted from automatic to manual operation in less than one-half minute.
- Permits the pre-selection and automatic use of as many as five different feeds for maximum cutting efficiency.
- Provides complete electric control from the point most convenient to operator.

For fast, repetitive shaft turning at its economical best, all signs point to the Monarch Motor-Trace. Any standard Monarch Lathe, 14" to 20" inclusive, can be factory-equipped with this automatic cycle, electric motor operated, electric tracer-controlled duplicating attachment. And its list of advantages results from 21 years of Monarch leadership in tracer-controlled lathe development.

You'll want full details, photos, performance data and case histories—so you can evaluate for yourself the benefits of Motor-Trace production in your shop. No ad can give it all, but our 12-page illustrated Bulletin #2302 does! We'll send it gladly, or any other information on the full Monarch line which today includes three tracer-controlled duplicating systems. Just indicate your interests. *The Monarch Machine Tool Company, Sidney, Ohio.*

Monarch
TURNING MACHINES
ACCURACY • ECONOMY • LONG LIFE

FOR A GOOD TURN FASTER . . . TURN TO MONARCH

THE MONARCH MACHINE TOOL CO., Sidney, Ohio

Gentlemen: Please send without obligation the following complete Bulletins:

- ☐ Bulletin #2302—The Monarch Motor-Trace
- ☐ Bulletin #2606—The Monarch Air-Gage Tracer
- ☐ Bulletin #2401—Monarch-Keller Controls

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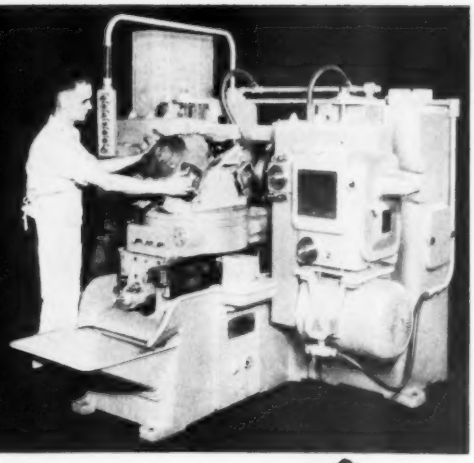
COMPANY _____

ADDRESS _____

CITY _____ ZONE ____ STATE _____

Improve Methods and Increase Milling Production...

With SUNDSTRAND Machines and "Engineered Production"

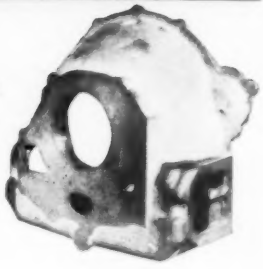


Basically, there are two approaches to solving production milling problems,- (1) obtaining standard machines, then trying to process parts over these machines so as to meet production requirements, (2) designing the most productive processing method, then obtaining machines to suit this method — standard or semi-standard machines, if possible, or entirely special machines, if necessary.

This latter method is Sundstrand "Engineered Production"... the most practical approach to economical production milling. The following is a brief resume of the complete engineering and manufacturing service available from Sundstrand to meet all or any of your production milling requirements in small and medium size work.

These actual examples are presented to reveal one of each of the methods used in solving milling production problems. One of these methods may be the solution to your present problem.

1 Milling 100 Parts Per Hour On Standard Rigidmil



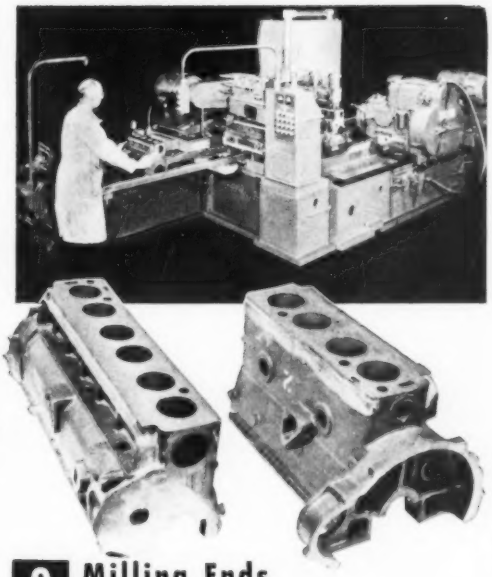
This Standard Sundstrand Model 33 Duplex Rigidmil has two work holding fixtures. These are mounted on a Standard Sundstrand Index base which is arranged to index the work 180°. This permits unloading and reloading of work during the automatic milling cycle. Opposed pads on transmission housings are milled at the rate of 100 pieces per hour. This is a good example of a special high production milling problem solved with standard equipment. The Model 33 Rigidmil can be furnished as either a simplex or duplex model. It has a mechanical feed box with a 100 to 1 ratio between high and low feed rate drive to the table feed screw. Two standard feed ranges of 1/2″ to 50″ or 1″ to 100″ per minute are optional. Two 30 to 1 ratio spindle heads are furnished on this installation. Six different head arrangements offer a spindle speed selection of 13 to 3600 rpm.

SUNDSTRAND

RIGIDMILS • FLUID-SCREW RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT

2 Milling Two Pads Simultaneously On Semi-Standard Rigidmil

Here's another application of the Sundstrand Model 33 Rigidmil. Aside from the column and special head, this is the same machine shown under example number one. The machine is provided with one vertical spindle and one angular spindle combined in a special head for milling two pads simultaneously. A simple work-holding fixture bolted to the machine table holds the work during the automatic cycle of rapid approach, feed and rapid return. The part is a tractor gear case. Two pads are milled at the rate of 32 gear cases per hour.

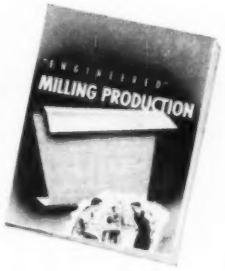


3 Milling Ends Of 4 and 6 Cylinder Blocks Simultaneously On Special Rigidmil

Cylinder blocks in mixed lots of 4 and 6 cylinders are rough and finish milled in this 3 station special machine. Two 25 hp opposed traveling heads, operating simultaneously at either end of machine, each carry two spindles for rough and finish milling opposite ends of the blocks. Located between the heads is the automatic positioning station into which the blocks are automatically shuttled after one end has been milled. Here, during a cutting cycle, the shorter 4-cylinder blocks are cross-positioned for milling the opposite end. Hourly production is 42 cylinder blocks of mixed sizes milled on both ends.

FREE
Additional Data

You'll find plenty of milling methods in this book . . . methods that may provide a short cut or profitable solution to similar jobs in your shop now. Tooling diagrams and machine designs are both included. Write for your copy today. Ask for bulletin No. 110.

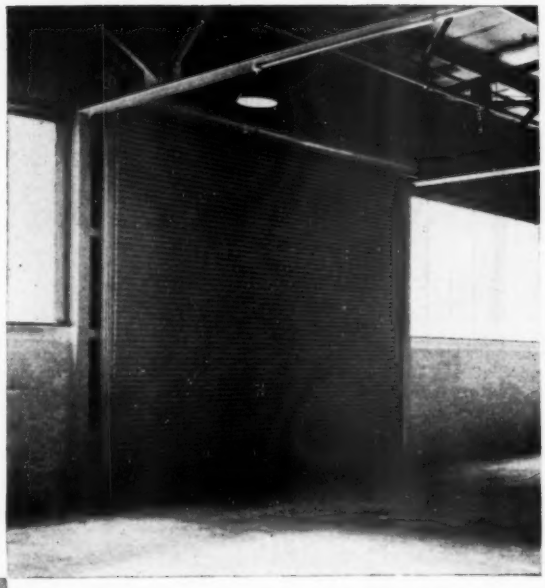


SUNDSTRAND

SUNDSTRAND
Machine Tool Company
2533 Eleventh St. Rockford, Ill., U.S.A.

DRILLING AND CENTERING MACHINES • SPECIAL MILLING AND TURNING MACHINES

one man opens these 1700-pound doors

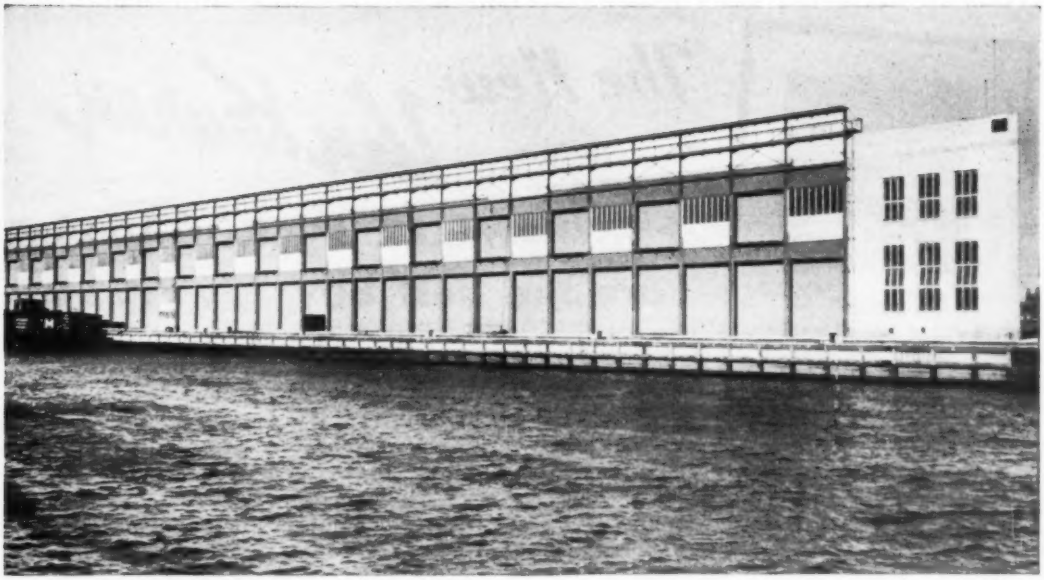


Pier 80, the Jackson Street Pier, is the newest commercial pier in Philadelphia. It's 994′ long and 308′ wide. This staunchly-built pier contains 146 steel rolling doors, counter-balanced by 292 torsion springs specially designed for this job by American Steel & Wire Company.

The doors are big (downstairs they're 22′ wide, 18′ high). The doors are heavy (1700 lbs.). One man must be able to operate them quickly, and they must be completely reliable in service.

The American Quality Springs are wound-up under terrific force when the doors are down, thus counter-balancing the tremendous weight. The springs are now in operation, and have given perfect service despite the large deflections. It's a typical tough job, easily solved with American Quality Springs.

American Steel & Wire Company makes springs of all sizes, ranging from locomotive and washing machine springs down to the tiny but reliable springs for cigarette lighters. So no matter what your problem, it will pay you to get the product-tested advice of our skilled spring engineers. Write to American Steel & Wire Company, Rockefeller Building, Cleveland 13, Ohio.



they're balanced with
AMERICAN QUALITY *Springs*

the spring's the thing

AMERICAN STEEL & WIRE COMPANY, GENERAL OFFICES: CLEVELAND, OHIO • COLUMBIA STEEL COMPANY, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
TENNESSEE COAL, IRON & RAILROAD COMPANY, BIRMINGHAM, SOUTHERN DISTRIBUTORS • UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

AMERICAN QUALITY SPRINGS

UNITED STATES STEEL

Shop Set MTT . . . 35 blocks giving 140,000 combinations in ten thousandths. Price in mahogany case, $115.00.

Economy Set MT . . . Over 5000 combinations in thousandths. Price in mahogany case, $46.00.

Micrometer Set M2I . . . Includes 1", 2", 3", 4", 5", and 6" Microgages. Price in mahogany case, $69.00.

Toolmakers Set M64 . . . Gives 121 combinations in 16ths, 32nds and 64ths. Price in mahogany case, $20.00.

The New Van Keuren

7/8 DIAMETER MICROGAGES are the best buy . . . . . .

60% More Wearing Surface . . . 25% Greater Accuracy . . . No increase in price.

A FOUNDATION FOR ACCURACY FOR 25 YEARS

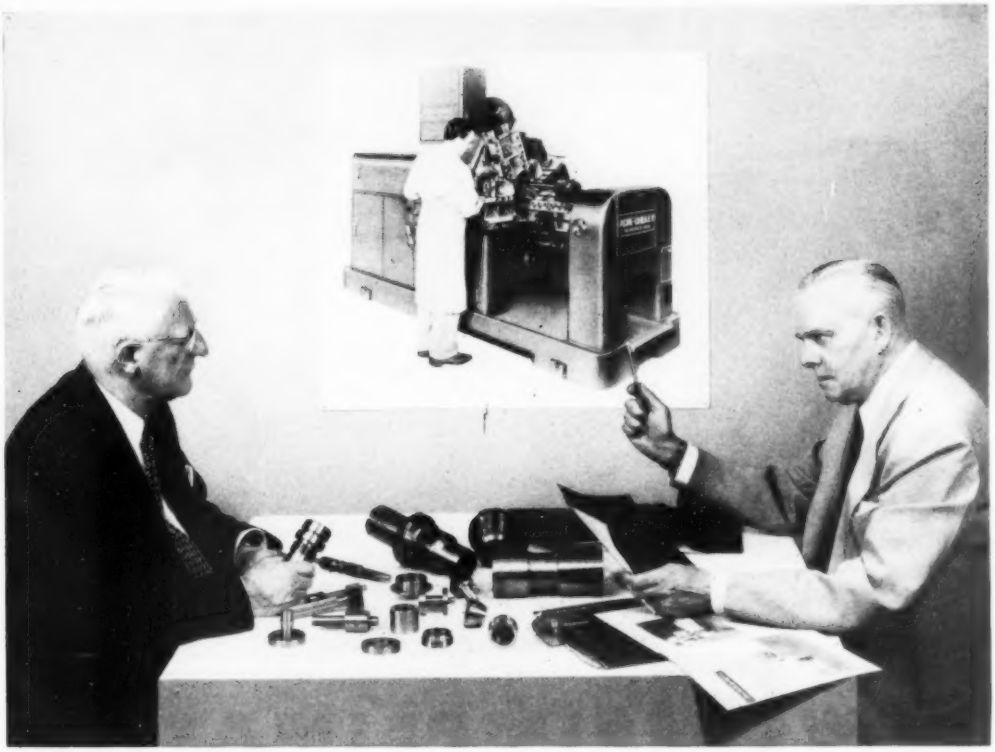
Van Keuren Microgages have been popular for over 25 years, because they provide a low cost means of securing accuracy in the shop, to meet the demands of the inspection department. The original Microgages were made 11/16" in diameter. The 7/8" body diameter of the NEW Microgages are ground true cylinders, and the end surfaces are held square with the body within close limits. This enables them to be easily aligned on machine ways for measuring carriage travel. The new Microgages have 40% more wearing surface than rectangular gages and they wring together tenaciously. The 7/8" diameter body provides excellent rigidity for the 6" long blocks.

Microgages up to 1" length are held within a tolerance of plus 12 millionths minus 8 millionths. They have an average wear allowance of 4 millionths oversize. They are available as individual gages from .0625" to 6" length, or in sets especially designed for general shop use, for tool setting and for tool makers and machinists.

THE Van Keuren CO., 173 WALTHAM STREET, WATERTOWN, MASS.

32nd YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Plug Gages • Carboloy Measuring Wires



PIN-UP FOR PRODUCTION WITHOUT EXPERIMENTATION

With an Acme-Gridley Model M Bar Automatic you're ready to *go* on munitions parts like these. No educational orders, trial runs or experimental tooling necessary!

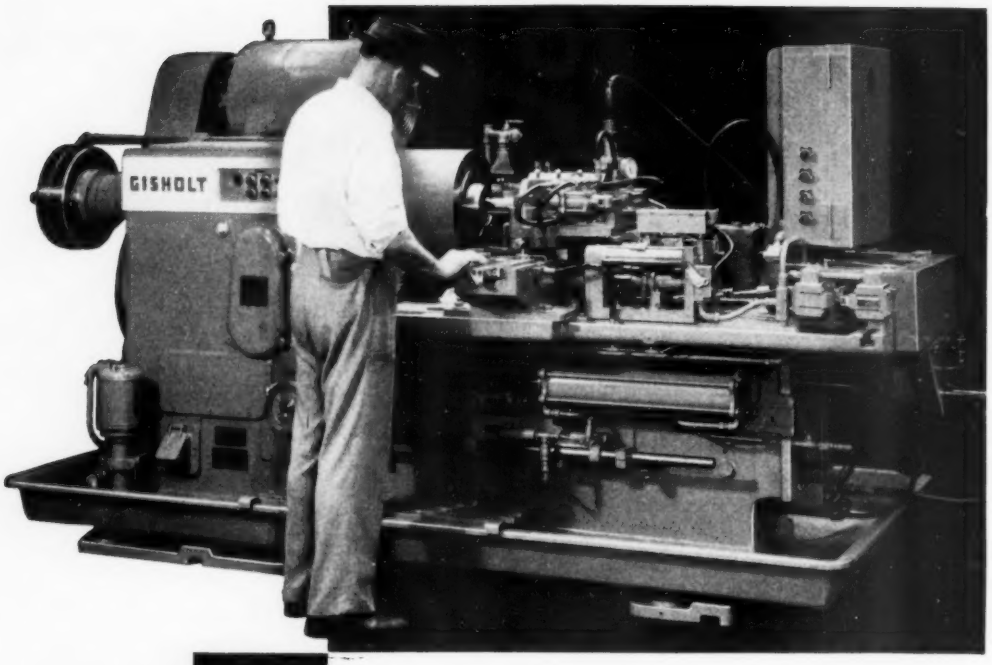
National Acme engineers have taken all those preliminary steps for you, months ago. The standardized tooling and production methods they set up are proved in use on many batteries of Acme-Gridley automatics, turning out countless millions of parts, 'round the clock, for quick rearmament.

So don't waste time in expensive experimentation . . . avail yourself of this ready-made experience that comes as a plus value to every Acme-Gridley owner. Our engineers will be glad to get you started on the road to greater munitions production, *greater profit*. They'll also be able to give you the latest information on how to take advantage of our constantly improving methods to get top performance from your present Acme-Gridleys. May we help you?

THE NATIONAL ACME COMPANY

170 EAST 131st STREET • CLEVELAND 8, OHIO

ACME-GRIDLEY BAR and CHUCKING AUTOMATICS built in 1, 4, 6 and 8 spindle styles, maintain accuracy at the highest spindle speeds and fastest feeds modern cutting tools can withstand.



HOW 8 SIMPLIMATICS

cut machine time 50%
cut man-hours 75%

The way you can slash costs with the Gisholt Simplimatic often surprises some of the most experienced production men.

Here's a big shop which found that 8 Simplimatics could take over the job done on 16 other machines. And it takes only 4 operators instead of 16 to turn out the volume of parts required.

Not the least in the cost picture is the machine itself. For the basic Simplimatic design permits you to individualize the machine to a high degree to solve many different problems. Thus, for many jobs you can have all the advantages of a special machine merely with special tooling. Yet it's all done on a Standard Simplimatic—at far lower cost.

The importance of lower costs these days makes it important for you to get all the facts about Simplimatic Automatic Lathes.

The GISHOLT ROUND TABLE *represents the collective experience of specialists in the machining, surface finishing and balancing of round and partly round parts. Your problems are welcomed here.*

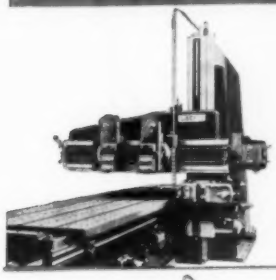
In producing these tool joint pins and boxes, the 8 Simplimatics work in pairs with fully automatic operation: one man can easily tend two machines.

Ask about the many different arrangements possible on the Standard Simplimatics with platen table, vertical head, etc.

GISHOLT MACHINE COMPANY, *Madison 10, Wisconsin*

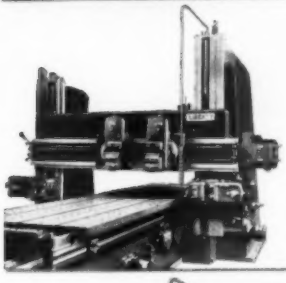
TURRET LATHES • AUTOMATIC LATHES • BALANCERS • SUPERFINISHERS • SPECIAL MACHINES

LIBERTY BUILDS 3 *great* PLANERS



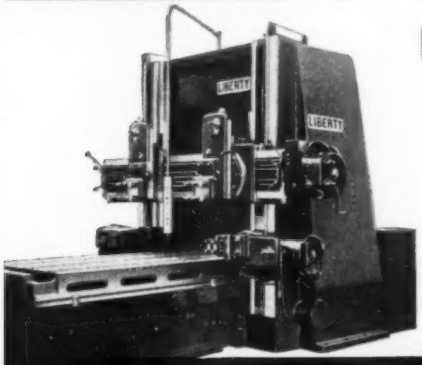
OPEN SIDE

For shops handling work of variable widths. Wide-faced housing and motorized clamp give rigidity for heavy roughing cuts and finishing. Dual control; electric feeds; rapid traverse to all Heads in all directions.



CONVERTIBLE

For exceptional rigidity on variable widths. Two, three or four heads. Offset heads permit closest approach of tools. Double balanced driving gear and pinions. Extreme accuracy.



DOUBLE HOUSING

For rapid production combined with accuracy. Two, three or four heads. Extremely rigid; handles production work with maximum cutting feeds and speeds. Table pulled into tool. Electric clamping and dual control for ease of operation; high production.

Write for catalog giving complete details.

All lengths, 24″ x 24″ wide and larger.

LIBERTY PLANERS, INC.

HAMILTON, OHIO

GENERAL DISTRIBUTORS: BRYANT MACHINERY & ENGINEERING COMPANY, 400 W. MADISON ST., CHICAGO 6

Exclusive Representatives in All Principal Cities

DON'T BUY A PIG IN A POKE . . .

or sell one either

X-RAY

With the world's finest radiographic apparatus now available, why take chances on buying or selling imperfect castings. It's like a pig in a poke when you do, for only x-ray equipment can detect many hidden defects in castings.

Scores of companies now rely on General Electric X-Ray industrial units, such as the OX-250 shown here, for proof of sound castings. Job lot or production line, x-ray fits. Spot checking or 100% inspection, it can be adapted to your particular need. A pound of metal or a ton, there's a GE X-Ray unit to meet the need — dependably, economically, profitably.

Write for Pub. 11A-3116 "Radiography as a Foundry Tool." X-Ray Dept., General Electric Company, Milwaukee 14, Wisconsin, Rm. AB-8.

GENERAL ELECTRIC

first & finest!

Jones & Lamson Radial Chaser Die Heads

GROUND with THREAD CHASERS

These Die Heads will do an outstanding job on large or small lots, in pitches ranging from extremely fine to coarse multiple Acme.

They are versatile tools with an over-all capacity of from No. 8 to 4¼".

They require no more than the proper chasers to cut either right- or left-hand threads. No extra equipment is needed.

They are easy to install and simple to handle. For almost half a century J&L Dies and Chasers have been the answer to a multitude of threading jobs throughout the world.

Look at these features that make them leaders in their field and give you better threads at lower cost:

STRENGTH

Every part is of solid steel, hardened and precision ground. There are no built-up sections. Dependability and ultimate capacity are assured.

FLOAT

All models are built with both concentric and longitudinal float.

DUAL-DIAMETER CONTROL LEVER FOR ROUGHING AND FINISHING CUTS

Heavy rough cuts, followed by light, accurate finish cuts can be taken with the same set of chasers by merely moving the roughing attachment lever. This is often a chaser saver on heavy, coarse pitch jobs, especially where short chamfers are a requirement.

SIZE ADJUSTMENT

The external micrometer adjusting screw provides simple and precise setting to exact pitch diameter. It is easy to set and maintain sizes well within your thread tolerances.

RAPID CHASER CHANGE-OVER

Chasers are removed for resharpening, or size replacement, by merely removing the front cover of the Die. No tools are required. Change-over is a matter of seconds — which means more hours available for production.

Write to Dept. 710 for illustrated catalog and complete information.

Thread Tool Division

JONES & LAMSON

MACHINE COMPANY
Springfield, Vermont, U.S.A.

Machine Tool Craftsmen Since 1835

ARMSTRONG WRENCHES

Choose Your Wrenches as you do your friends--for life

Specify ARMSTRONG Wrenches for lifetime service, for finely balanced tools that feel right in the hand and make work easier, faster and less fatiguing. ARMSTRONG Wrenches generally are longer for size—give greater leverage. Accurately milled or broached openings give the proper clearance. They are safe wrenches because they are strong beyond need.

Drop forged and machined from high tensile carbon or special alloy tool steels, ARMSTRONG Wrenches are heat treated, tempered and tested to an exact balance of toughness, hardness and tensile strength. Each is beautiful in finish and line, is a quality tool to be proudly possessed by any mechanic—or certain to "give a lift" to any assembly line. Buy wrenches which carry the trade marks HI-TEN or ARMALOY. On carbon or alloy steel wrenches these trade marks are your guarantee of lifetime quality.

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5215 W. ARMSTRONG AVENUE CHICAGO 30, ILL.

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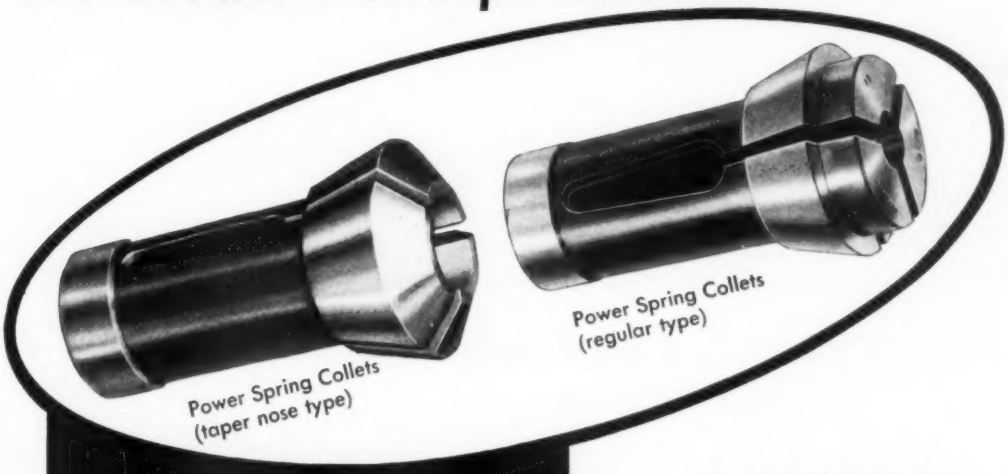
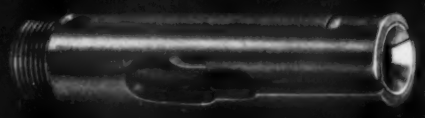
COLLETS and FEED FINGERS

for *Brown & Sharpe* machines

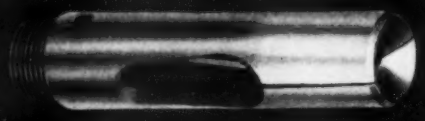


Power Spring Collets (taper nose type)

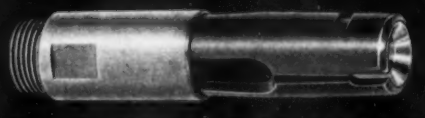
Power Spring Collets (regular type)



Master Feed Fingers and Pads



Feed Fingers (regular type)



Master Feed Fingers with Adjustable Tension for No. 00, 00G, 0 and 0G Machines.

To get maximum production efficiency from your Brown & Sharpe Automatics and Wire Feed Screw Machines — specify HARDINGE Collets and Feed Fingers.

Specifically engineered, customer-shop tested and approved for Brown & Sharpe Machines, Hardinge Collets and Feed Fingers will reduce tooling costs and step up production.

Write for Catalog 36 — contains complete descriptions, specifications and ordering information.

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

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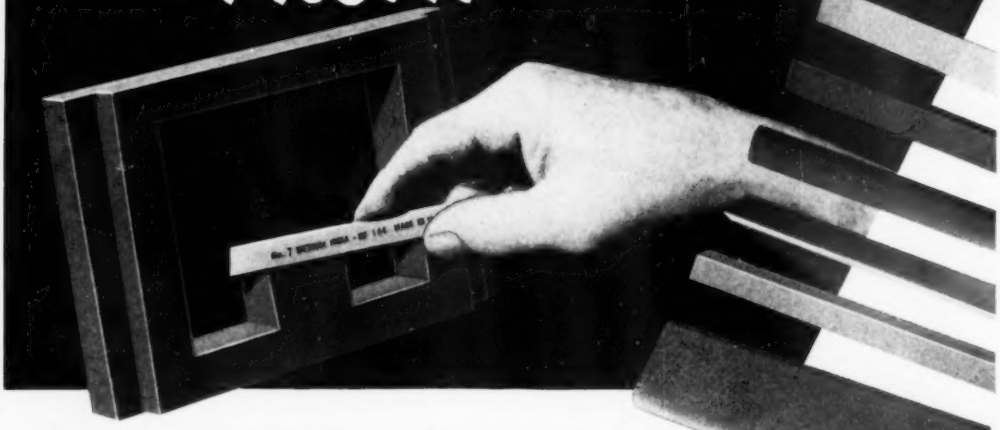

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THE FINAL STONING on a die may spell all the difference between a production job that's a headache — or a source of solid profit. In the trained hand of the diemaker, these NORTON Abrasive oilstone files are a true precision tool, fabricated to produce the initial accuracy that is reproduced in volume in the ultimate product. NORTON Abrasive electric-furnace INDIA and natural HARD ARKANSAS are available in a complete line of files, slips and bench stones.

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Greater production... *it's in the CARDS!*

Whether your parts are ferrous, non-ferrous or non-metallic — if they require flat surfaces, the chances are that a Blanchard can grind them faster, better and cheaper than by any other machining method.

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Most jobs require no holding fixtures, and many jobs with surfaces of varying heights may be handled on the magnetic chuck with simple steel blocks. For help in obtaining the accurate production of your own parts, write for the two free catalogs shown below.

All work done on a NO. 18 BLANCHARD with 36" chuck.

V-414

Send for your free copies of "Work Done on the Blanchard," fourth edition, and "Art of Blanchard Surface Grinding."

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THE BLANCHARD MACHINE CO.

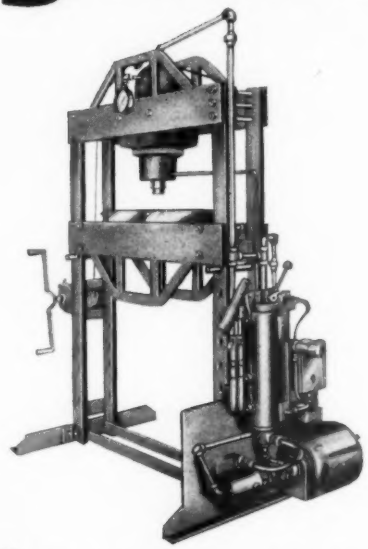
64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.

...and we can do it again!

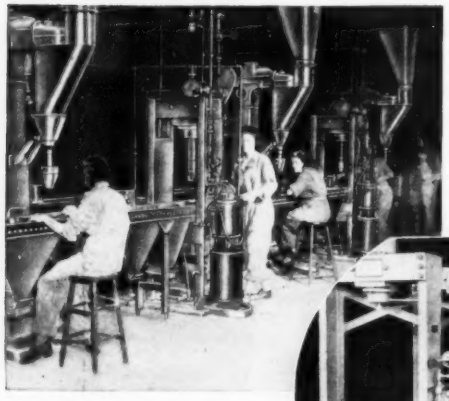
K. R. WILSON IS BACK ON AMERICA'S DEFENSE TEAM

NEW threats, new aggressions bring to mind the part KRW played in World War II. Navy ships equipped with machine shops had special 25 ton KRW Hydraulic Presses. Thousands of special air-oil operated ammunition loading presses were supplied to shell and bomb loading contractors. KRW presses speeded safe operations in the nation's largest arsenals. In fact, hundreds of industries helped to speed victory with KRW presses.

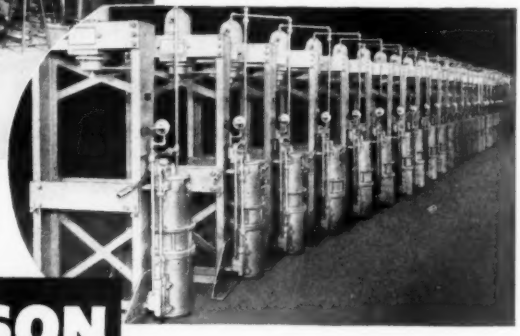
Now, unfortunately, America is threatened again. Here at KRW we're ready and determined to add our muscles to the nation's strength. All our facilities are at your disposal. If you need standard KRW presses, we'll get them to you right away. If you need specially-built presses, our engineering department will design them to your needs. Let us know! Write Dept. 15 for full information.



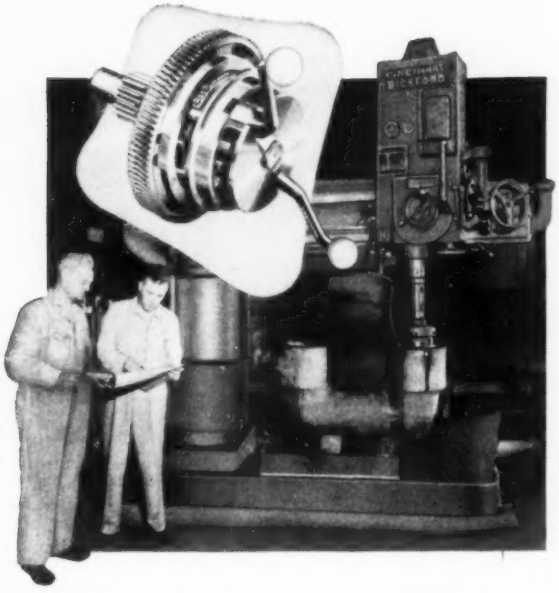
HERE'S the 37MD-1 KRW Hydraulic Press, ideally suited for trying out dies before sending them to production runs. KRW presses from 25-150 tons, hand operated, air operated or motor driven; one, two and three cylinder models; fast, flexible and self-contained above ground.



THOUSANDS of these special ammunition loading presses were used for safe shell loading during World War II. Let our engineers show you how KRW can speed production and cut costs for you.



K·R·WILSON



At the Wheland Company, Chattanooga, Tennessee, this 6' arm 19" diameter column SUPER SERVICE Radial is boring 11-1/8" diameter holes out to a finished size of **11-3/4" diameter** in **cast steel** pump parts, holding an accuracy of plus or minus .001".

11¾" in CAST STEEL

Heavy work is being performed with absolute safety on Cincinnati Bickford SUPER SERVICE drilling machines, with extreme ease of operation. Unlike any other, the SUPER SERVICE clutch is a sturdy positive tooth type. It has a large diameter hardened steel ring, with saw tooth serrations on the inner circumference, into which two opposed serrated hardened steel segments are snapped instantly by touching either one of the twin quick return levers. This requires only finger tip effort.

The feed is driven by the spindle through a safety feed gear. This is a patented exclusive feature of the SUPER SERVICE Radial and guarantees protection of this mechanism for the life of the machine, against damage due to over-load.

Write for further information about our complete line of Upright and Radial metal drilling machines.

Equal Efficiency of Every Unit
Makes the Balanced Machine

THE CINCINNATI BICKFORD TOOL CO
RADIAL AND UPRIGHT SUPER SERVICE DRILLING MACHINES
Radials 7½" dia. col., 2½" arm, to 26" dia. col., 12' arm.
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THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9, Ohio U.S.A.

Single-purpose machines cut costs

Special automatic drilling and tapping machines save money with high production

Dear Sir:

In an hour one Kingsbury with one operator performs 5,184 operations on lock cylinders. In one hour the other Kingsbury with one operator performs 5,824 operations on gear housings. (Both at 80% efficiency.)

ACCURATE, UNIFORM PARTS

All operations are complete in one chucking. Bushings guide the drills. Fixtures are duplicates, jig bored to minimum toolroom tolerances. Spindles are located to exact indicator readings and run in precision ball bearings. Automatic cycles make every part uniform.

UNIT COSTS IN PENNIES

Man and machine cost 8 10c for all 9 operations on each lock cylinder. They cost 1-9 10c for all 16 operations on each gear housing. These costs are based on 1) the national average wage rate, 2) 80% efficiency and 3) paying off the full cost of the machine and tooling in the first 6000 hours of operation. (No power or overhead.)

SHORT PAY-OFF PERIOD

Each machine will run many times longer than 6000 hours. We used that basis because most firms want their money back in 1 to 3 years. If the pay-off period were longer, they would try other methods.

CHECK COSTS FROM PROPOSALS

We prepare many proposals on tooled machines so that high production plants can compare their costs. Many never result in orders, of course, a fact that our general manager accepts philosophically. "At least they are fun to work out," he says, pausing for a reaction.

So don't hesitate to ask for a proposal. Send a print to our Mr. L. A. Carll and tell him the operations and hourly output you need. And ask him for free bulletins that show 40 setups.

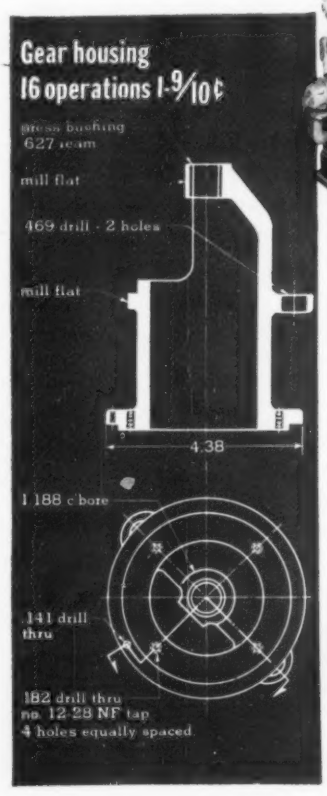
Sincerely,

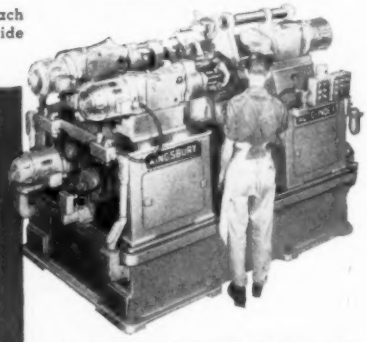
Kingsbury Machine Tool Corp.
20 Laurel St., Keene, N. H.

720 PARTS AN HOUR GROSS. This horizontal indexing Kingsbury drills the 6 pin holes, mills the T-slot and spots the dubb hole in one chucking.

- Six units drill the pin holes. Each fixture has a bushing plate to guide the drills.

- Two units mill the T-slot — one the throat and one the head space.
- An underneath unit spots the dubb hole. A bushing guides the drill.
- A hand plunger ejects each finished part from its fixture.





455 PARTS AN HOUR GROSS. This vertical indexing Kingsbury enables 8 automatic units to operate on opposite faces of the part in the same chucking.

- An air-operated mechanism with chute feed inserts the bushing at the first working station on the right. A standard unit reams the bushing to size at the fifth station.
- The 1.188 counterbore is piloted. Its spindle has a 7-inch stroke to reach deep inside the part.
- Standard drilling units with standard milling heads mill the flats.
- Standard units with 2- or 4-spindle auxiliary heads operate on the two .469 and four tapped holes.

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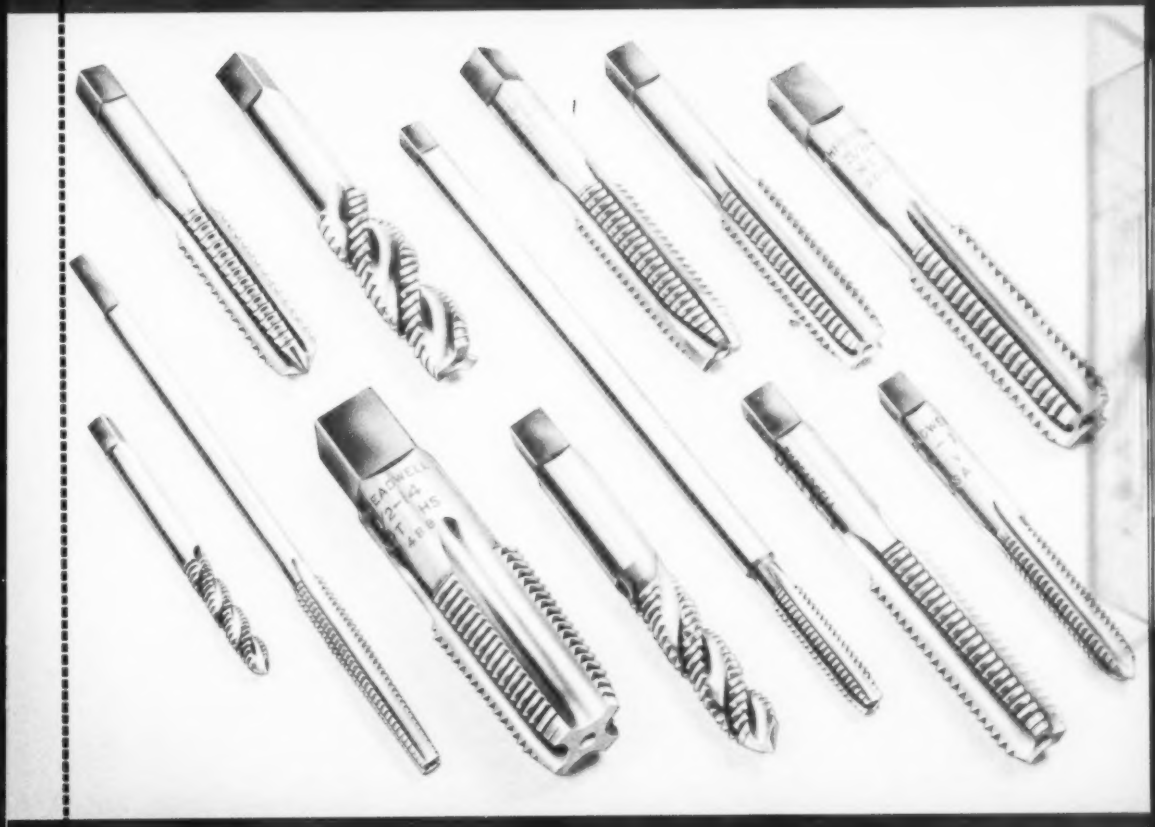
AUTOMATIC DRILLING AND TAPPING MACHINES
for Low-Cost High Production

Threadwell TAPS



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OFFSET for GRINDING TAP FLUTES

SIZE OF TAP	ANGLE OF RAKE OR HOOK														
	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	12°	14°	16°	18°	20°
	OFFSET FROM CENTERLINE OF TAP														
#6	.001	.002	.004	.005	.006	.007	.009	.010	.011	.012	.015	.018	.020	.023	.026
#8	.001	.003	.004	.006	.007	.009	.010	.012	.013	.015	.018	.021	.024	.027	.030
#10	.002	.003	.005	.007	.008	.010	.012	.014	.015	.017	.020	.024	.028	.031	.035
#12	.002	.004	.006	.008	.010	.012	.014	.015	.017	.020	.023	.028	.032	.036	.040
1/4	.002	.004	.007	.009	.011	.013	.016	.018	.020	.022	.027	.032	.037	.041	.046
5/16	.003	.006	.008	.011	.014	.017	.020	.022	.025	.028	.034	.040	.046	.052	.058
3/8	.003	.007	.010	.013	.017	.020	.023	.027	.030	.033	.040	.047	.055	.062	.069
7/16	.004	.008	.012	.016	.019	.023	.027	.031	.035	.039	.047	.055	.064	.070	.081
1/2	.004	.009	.013	.018	.022	.027	.031	.035	.040	.045	.054	.063	.073	.082	.092
9/16	.005	.010	.015	.020	.025	.030	.035	.040	.045	.050	.061	.071	.082	.093	.104
5/8	.006	.011	.017	.022	.028	.033	.039	.044	.050	.056	.067	.079	.091	.103	.115
3/4	.007	.013	.020	.027	.033	.040	.047	.053	.060	.067	.081	.095	.109	.123	.138
7/8	.008	.015	.023	.031	.039	.046	.054	.062	.070	.078	.094	.110	.127	.144	.161
1	.009	.018	.026	.035	.044	.053	.062	.071	.080	.089	.107	.126	.144	.164	.184
1 1/8	.010	.020	.030	.040	.050	.060	.070	.080	.090	.100	.121	.142	.163	.185	.207
1 1/4	.011	.022	.033	.044	.055	.066	.077	.089	.100	.111	.134	.157	.181	.205	.230
1 3/8	.012	.024	.036	.049	.061	.073	.085	.098	.110	.122	.147	.173	.199	.225	.252
1 1/2	.013	.026	.040	.053	.066	.080	.093	.106	.120	.133	.161	.189	.217	.246	.276
1/8 Pipe	.003	.007	.010	.013	.017	.020	.023	.027	.030	.033	.040	.047	.054	.061	.069
1/4 "	.005	.009	.014	.019	.023	.028	.033	.038	.042	.047	.057	.067	.077	.087	.097
3/8 "	.006	.012	.018	.024	.029	.035	.041	.047	.053	.059	.071	.084	.096	.109	.122
1/2 "	.007	.015	.022	.029	.037	.044	.051	.059	.066	.074	.089	.104	.120	.136	.152
3/4 "	.009	.018	.027	.037	.046	.055	.064	.074	.083	.092	.111	.130	.150	.170	.190
1 "	.011	.023	.034	.046	.057	.069	.080	.092	.103	.115	.139	.163	.188	.212	.238
1 1/4 "	.015	.029	.043	.058	.072	.087	.101	.116	.131	.146	.176	.206	.237	.269	.302
1 1/2 "	.017	.033	.050	.066	.083	.100	.116	.133	.150	.167	.202	.236	.272	.308	.345

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Threadwell Tools do many jobs

they can do your tough ones

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Cimcool does a better job because it combines friction reduction and cooling capacity in a degree never before attained by old-fashioned cutting fluids. It replaces all water emulsions and all but a few highly compounded specialty oils. It's longer lasting in machines, too. So Cimcool reduces down-time and cuts labor costs for cleaning and changing.

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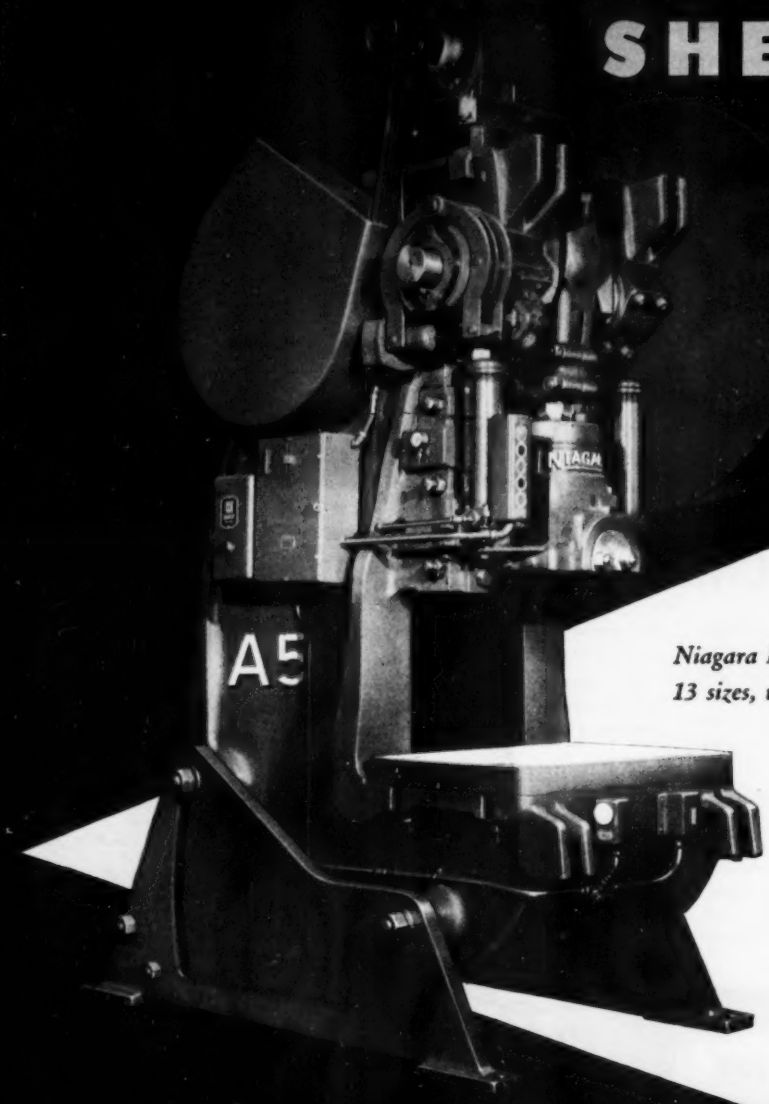
THE CINCINNATI MILLING MACHINE CO.

for 85%
OF ALL METAL CUTTING JOBS

NIAGARA

PRESSES AND SHEARS



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13 sizes, up to 6 1/2 inch shafts.

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Backlash

EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

Tidying Up Tolerances

I recently read the article by James K. Matter, "Tolerance Charts Forecast Accuracy" (*AM*—Oct. 23, '47, p114). The author is not clear on the principle of addition and subtraction of dimensions with tolerances, that is, on p 115, 1st col, 17th line: "Note that dimensions are subtracted but tolerances are added. That is right—added. In dealing with dimensions and tolerances whether adding or subtracting dimensions, tolerances must always be added."

Following this rule the author subtracts with faultless results as in the case:

$5.70 \pm 0.008 - 1.75 \pm 0.003 = 3.95 \pm 0.011$

This is true, however, only because the tolerances for each dimension are equal in magnitude. The result would be wrong in the case where the tolerances are different. If done according to the author's rule:

$5.70\ (+0.008, -0.001) - 1.75\ (+0.003, -0.006) = 3.95\ (+0.011, -0.007)$

This is wrong because:

Max. $= 5.708 - 1.744 = 3.964$

Min. $= 5.699 - 1.753 = 3.946$

Therefore the subtraction correctly done should be:

$5.70\ (+0.008, -0.001) - 1.75\ +0.003, -0.006) = 3.95\ (+0.014, -0.004)$

and the rule in its proper form is:

In subtracting of dimensions with tolerances, the signs of tolerances in the dimensions subtracted are changed and afterwards tolerances are added correspondingly.

When adding dimensions with tolerances, dimensions are added arithmetically with tolerances correspondingly, for example:

$5\ (+0.04, -0.02) + 2\ (+0.04, -0.03) = 7\ (+0.08, -0.05)$

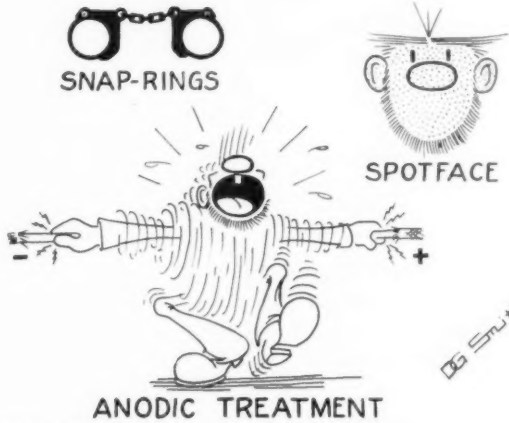
One rule to remember is that it is not permitted to add or subtract a resultant dimension with one of its components. For example, we know that:

$2\ (+0.1, -0.1) + 5\ (+0.0, -0.2 = 7\ (+0.1, -0.3)$. But $7\ (+0.1, -0.3) - 5\ (+0.0, -0.2)$ does not equal $2\ (+0.1, -0.1)$. Instead it equals $2\ (+0.3, -0.3)$.

When machining work from blue-

GRINETICS

BY D. G. SMITH



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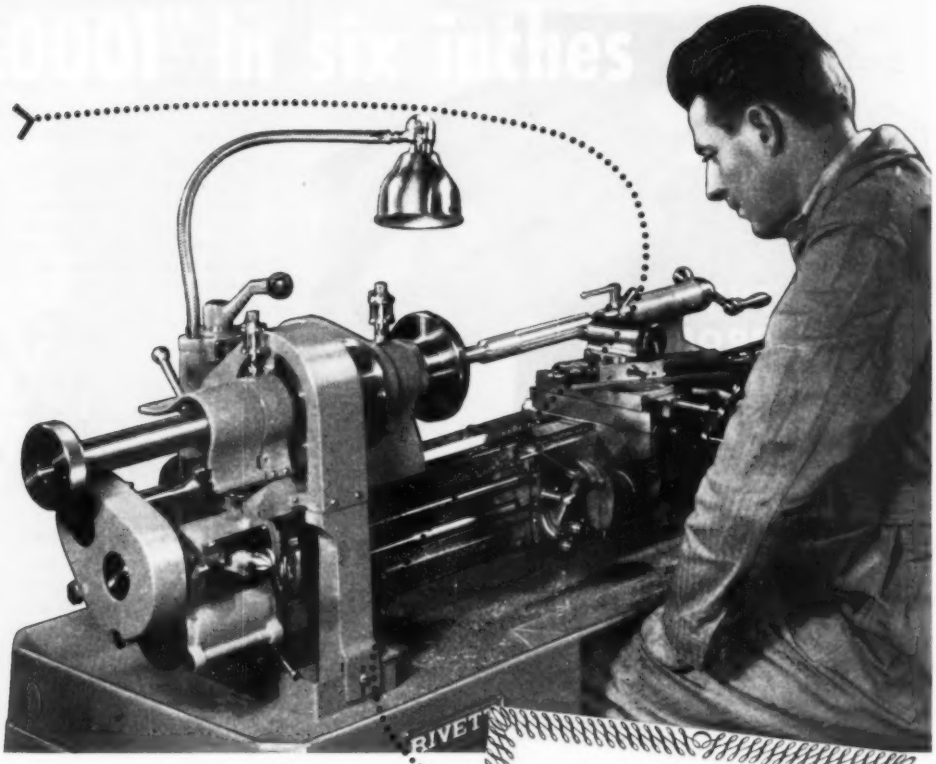

PLUS every known attachment!

A symbol of extreme accuracy for years, this Rivett 608 lathe is used in nearly every instrument and tool shop where fine exacting work is performed. A greater number of modern mechanical marvels have been developed on this small lathe than on all other machine tools combined.

But the 608 is not just a single-purpose tool — it is a small but exceedingly powerful back-geared, screw cutting engine lathe. It has slide areas equal to those of other lathes twice its size — its bronze-bearing spindle guarantees finish and perfect roundness for all work turned. Finely-made attachments for milling, spiral-cutting, slotting, relieving, taper turning, radius turning, grinding, and forming enable the user to complete his entire series of operations utilizing the inherent precision of the lathe itself.

GUARANTEE

The Rivett 608 will turn or bore within 0.0001" in six inches work held in collet, and turn between centers within 0.0001" in six inches. The Rivett 608 will face to eight inches diameter within a limit of 0.0002" concave, 0.0000" convex. The Rivett 608 will cut threads within 0.0005" in twelve inches, or within 0.0003" in any three inches, or within 0.0002" in any inch of a specimen piece.

You'll be adding your name to a prominent list of users by installing a 608 Rivett. For a more detailed story, **write for Bulletin 608F.**

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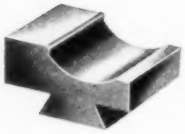
For More Precision Work *RELY ON RIVETT LATHES AND GRINDERS,* The Master Craftsman's Master Tools

with *Gorham*-ENGINEERED SPECIAL CUTTING TOOLS



Next time you're up against a tough tooling problem, call in the man who can give you *the right answers fast* . . . your nearby Gorham Field Engineer! He's an expert in special cutting tools . . . and he's ready to provide a complete engineering service to determine your exact tooling requirements. He starts with your product, sketch or idea. He surveys your production operations and available equipment. He considers work material properties and desired finishes and tolerances. He plots proper machine feed, speed and method of tool driving. Then he develops practical design and engineering specifications for special cutting tools, metallurgically "tailor-made" for your application.

His recommendations are backed by Gorham's unmatched facilities, which include three fully-equipped modern plants, a large Engineering and Metallurgical staff, and a force of field application engineers in principal industrial centers, coast-to-coast. All are dedicated to furnishing prompt and profitable solutions to your special tooling problems. Gorham-engineered "specials" are turning problems into profits in thousands of plants every day . . . why not let them do the same for *you?* If you haven't met your nearby Gorham Field Engineer, write for his name, or send details of your problem direct for recommendations.

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prints it often turns out that the most important dimension (with its tolerances) must be found from two other dimensions. In some cases two sets of gages are used to find this resultant. A cheaper and more accurate method is to move the basic gaging surface so as to apply only one gage.

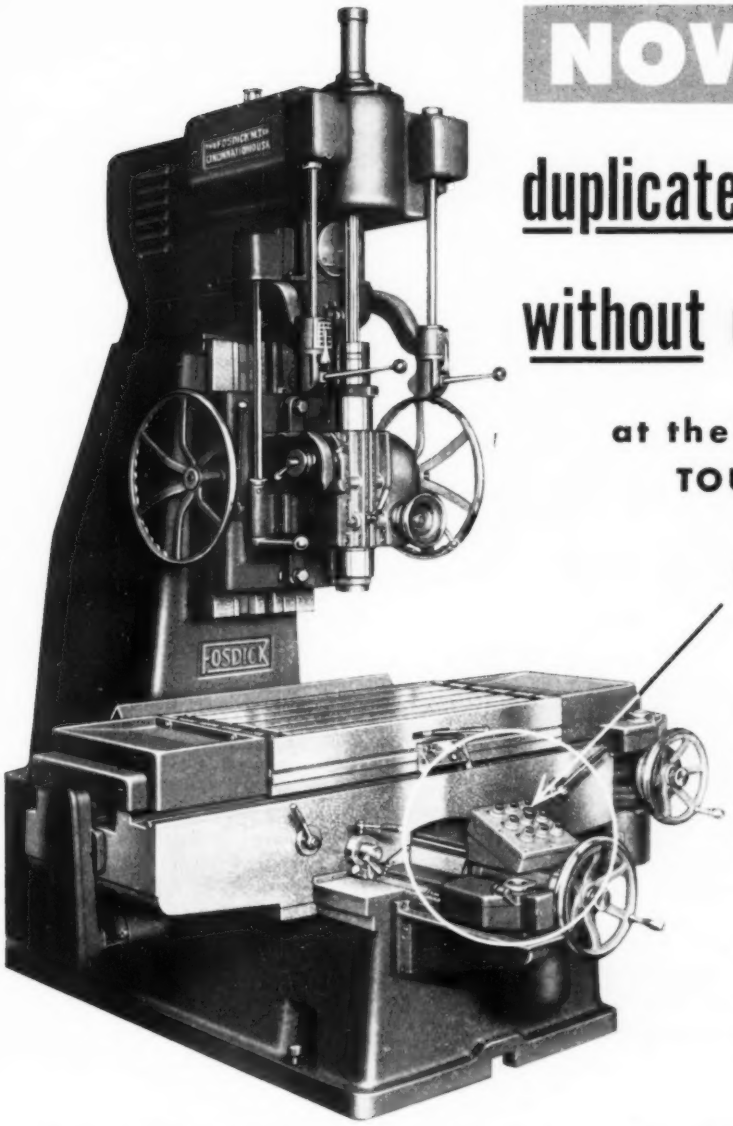
W. Hanka, Dipl. Ing.
Buenos Aires, Argentina

The article "Tolerance Charts Forecast Accuracy" referred to by Mr. Hanka was accurate for its purposes. All tolerances in the article and in the charts were both equal and symmetrical, therefore the author's rule worked.—Ed.

Wooden Screws

I see that you have had critical comment on the cutting of threads with a hand chaser, as depicted on cover of the March 5 AMERICAN MACHINIST. As this is outside the range of my personal experience, there seems little I can add which would carry any weight of authenticity. However, hand chasing must certainly have been general practice *somewhere*, for in an old Pratt & Whitney catalog which I keep on a nail in the shop (because of its wealth of handy tables and data) there is a broad listing of these chasing tools, pitches from 3 to 32, inside and outside, prices 50¢ for the coarser sizes, 35¢ for the finer, minus handles. An "inside" must have been a lulu for an inexperienced operator to use!

What is really on my mind, anent this cover, is the fact you show a capable pair of hands holding the "scratcher" in the act of deepening a short thread on the end of a WOOD rod—vaguely reminiscent of the handle for a Bissell sweeper, or maybe an O'Cedar mop (no chips or dust visible). The question of wood screws (or more accurately, wooden screws) was touched on in *AM* several years ago, but if the subject was carried to any definite conclusion, I failed to read that particular number. A drawing was published, in support of the theory they were lathe-turned, showing a man holding a tremendous chisel, supported by a revolving "master screw". Consider-



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Only two duplicating bars are required for each job – one for the table, one for the cross slide. They're made of standard ¾" bar stock, drilled for each hole to be produced in the work. Once the bars are set and the work initially positioned, the operator simply presses a button – rapid traverse motors take over, and in seconds the work is ready for the next operation.

A new Fosdick Automatic Positioning Machine in your shop will pay for itself many times over through savings in man-hours, set up time, materials and storage space. For more information write today for Bulletin JBA.

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FROM COAST TO COAST!

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ing the speeds necessary for working wood smoothly and without tearing or digging, I personally feel that this was physically impossible. Further, it is my impression these large screws were sometimes produced in backwoods areas, where rotary power was then non-existent.

In the smaller sizes, there is no doubt of the method. I am old enough to remember, as a child, the fascination of peering into the shop of an old-time mechanic, and its invariable huge collection of "parallel clamps" as well as beechwood "molding planes". Such tools had screws in diameters from less than ½ to over 1 in. and were cut by hand with a "stock" which could be found advertised in early mail-order catalogs, but a really clever man could construct his own. A friend of my deceased father had a "boughten one" and made most of his clamps himself. How they cut the female threads I do not recall. Bench vises had screws about 2½ in. in diameter, and from their smooth perfection were presumably cut in the same manner, or maybe factory-made. By the time I was big enough to be allowed in the shop, Dad had graduated to a purchased iron screw, but the vise was still the "leg" type, with jaws almost never parallel.

However, I would like to stir up an argument leading to definite explanation of how the larger (press or jack) screws were made, remote from city shops. Surely some older reader must know about this.

C. M. Warner
Altamont, N. Y.

I should have known better than to carve, in wood, a job that could be either wood or metal—and then fail to tag it! And I thought that that orange color, even on the newly cut threads, would indicate beyond a doubt that it was copper, not a mop handle. As for chips there were plenty, but would leaving them in be Art? I did make the operator's fingernails a little dirty, though.

I remember making, during the Prohibition era, a couple of fancy wooden screws for winepresses. These were turned on a conventional metal-cutting lathe, with conventional tools, but at top speed, and turned out pretty well—at least for a "government" job. By the way, how did they make those clampscrews? Some I've seen look like they were whittled and handfiled, but not to Class 4 fits. But even in backwoods areas, lathes have been common. We've published articles on boring long rifles with very primitive equipment.—EJT

Spells "finish" for another cutting problem

HERE'S the problem one midwest manufacturer posed to a Standard Oil lubrication specialist: improve the finish of steel valve seats produced on an automatic screw machine *and* reduce cutting oil costs.

STANICUT Cutting Oil 117 BCS was recommended and put to work. The problem was solved on both counts since STANICUT resulted in a finer finish on the valve seats and cost less than the oil previously used. Plant operators found a *bonus* advantage in STANICUT when records revealed longer tool life. That meant lower tool costs and less downtime for tool changes . . . additional economy in the cost of machining these parts.

In this case STANICUT replaced a single, more expensive cutting oil. In plant after plant, however, STANICUT has proved so versatile that it has replaced a variety of conventional oils, often serving every operation in the shop or department.

There is a Standard Oil lubrication specialist at your service wherever you are located in the Midwest. For his help in selecting a better cutting oil for your operation (or operations) contact your local Standard Oil office or write:

Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

STANICUT
TRADE MARK
Cutting Oil

What's your problem?

D. J. Clark, of Standard Oil's Saginaw office, is the lubrication specialist who recommended STANICUT in this case, and thereby not only solved the problem at hand, but made additional savings possible for the manufacturer.

His on-the-job service is typical of that available to all midwest plants through a corps of such specialists. You can be sure that the specialist in your area has both the practical experience and the training in a Standard Oil Lubrication Engineering School that will result in dependable, thorough assistance.

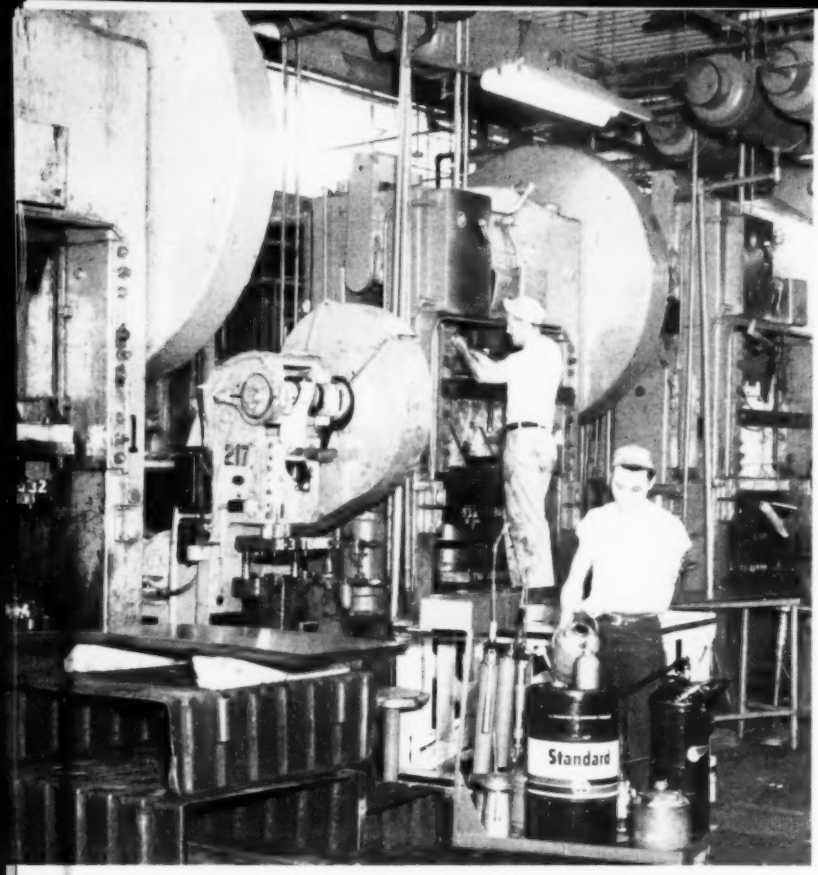
A post card or phone call to your nearest Standard Oil (Indiana) office is all that's necessary to put a Standard lubrication specialist to work on your problem. When he calls, be sure to discuss the advantages and performance records of these outstanding products:

STANICOOL HD Soluble Oils Because they contain additional compounding, these heavy-duty soluble oils possess not only the cooling ability of an emulsion but also the ability to give better tool life and finer finishes than can be obtained with a conventional soluble oil.

STANOSTAMP Compounds Here are three established products for stamping or heavy drawing operations of either low-carbon or alloy steels. Water can be added to these paste compounds to provide the most economical applications. STANOSTAMPS offer maximum protection for dies and work. These compounds can be readily removed in conventional washing equipment.

STANDARD OIL COMPANY

STANDARD *(Indiana)*



No drips in this press room

WHEN plant engineers at the A. O. Smith Corporation Kankakee Works tested STANODRIP Dripless Oil No. 59 on the recommendation of a Standard Oil lubrication specialist, they found the solution for press room lubrication troubles.

STANODRIP ended the drippage of oil from bearings on stamping and punch presses. That meant cleaner and safer working conditions, less lubricant consumption, and fewer lubrication applications. As a result, STANODRIP is now used throughout the press room and is being adopted by other departments as well. "Reduced maintenance costs and longer life of our equipment are definite advantages . . . ," says Don Hartquist, Plant Engineering Supervisor.

To help put STANODRIP Dripless Oils to work wherever leakage or drippage is a problem . . . or for assistance in all phases of industrial lubrication . . . call in the Standard Oil lubrication specialist in your area. Contact your local Standard Oil Company (Indiana) office, or write: Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

Stanodrip
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Dripless Oil

What's your problem?

C. B. Eggen of the Standard Oil office in Joliet is the specialist who helped solve this press room lubrication problem for A. O. Smith Corporation.

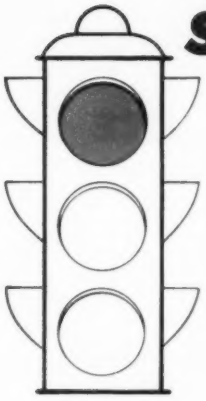
With a broad background of practical experience and special training, his service is typical of the assistance available to plants located everywhere in the Midwest. Like others in the corps of Standard Oil lubrication specialists, he makes his headquarters near the plants he serves.

To take advantage of prompt, on-the-spot service in your own plant, phone or write the Standard Oil office in your area. When the lubrication specialist calls on you, be sure to get full information on these fine Standard Oil products:

CALUMET Viscous Lubricants — These greases strongly resist washing and throw-off. Their superior wetting ability affords better coating of open gears and chains, better internal lubrication of wire ropes.

STANORUST Rust Preventives — The eight grades of STANORUSTs form one of the most complete and effective lines of rust preventives available. Each has been scientifically developed for its intended use. The grades range from a fingerprint remover to a heavy petrolatum that protects against corrosion for years under the most severe outdoor exposure.

STANDARD OIL COMPANY STANDARD *(Indiana)*



STOP!

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WORK SPOILAGE

COSTLY DOWN-TIME

WITH **MAXITORQ**

automatic OVERLOAD *RELEASE* CLUTCH

When an accidental overload occurs on some types of high speed automatic machinery . . . packaging, wrapping, can and bottle labeling machines, for instance . . . there's the devil to pay. Glass may fly, cans be dented, wrappers and labels spoiled, machine mechanisms damaged . . . perhaps an operator injured. And costly down-time bites into profits.

But . . . there's an answer . . . the Maxitorq automatic Overload Release Clutch for original equipment in such machines. Where the nature of the overload is either a heavy shock or a suddenly applied load of a magnitude substantially greater than normal driving load, the O-R Clutch instantly releases . . . stopping the machine, preventing damage to machine and product. When the jammed condition has been cleared the clutch is re-engaged and the machine is again in operation.

Because this clutch *does* have definite limitations it must be properly applied for maximum effect . . . and Maxitorq engineers will gladly provide practical recommendations. There are six sizes of clutches (¼ to 5 H.P. @ 100 r.p.m.) and Hub, Ring, Flange and Cut-off Coupling Cups for connecting clutch to driven or driving member. Complete details on request.

Send for Bulletin No. AM 8

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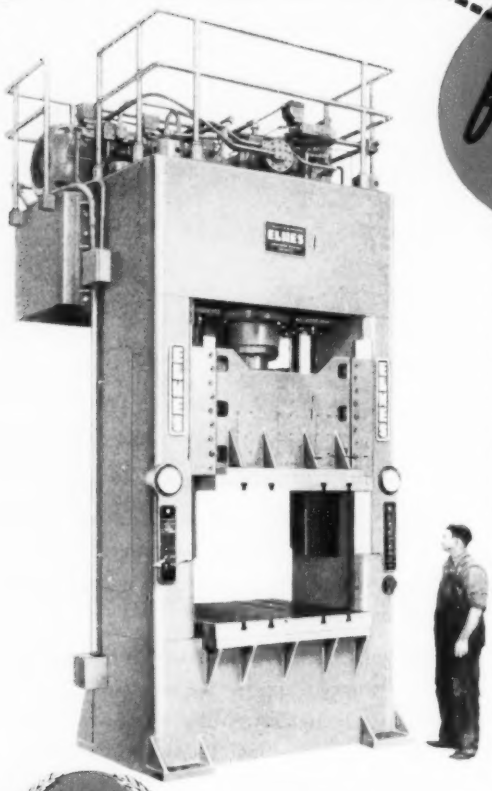

300-ton ELMES Drawing and Forming Press equipped with 2 Pressure Cycles

ELMES 100th Anniversary 1851-1951 HYDRAULIC EQUIPMENT

The Elmes Hydraulic Equipment produced today represents the accumulated experience of one hundred years of progressive engineering. Since 1851, and from the very pioneering days of hydraulics, Elmes equipment has meant dependable, economical performance.

The new press shown here is typical of Elmes *specialized design.* Developed specifically for the manufacture of plow beams, this press has a special hydraulic circuit providing *two pressure cycles in one.* Operation is by electrical control, using two foot switches. By actuating one foot switch, the ram is made to exert low tonnage for bending the plow beams to a specific angle; the beams are then turned and flattened under high tonnage by operating the other foot switch. The press is arranged for pressure reversal as well as position reversal.

Conveniently located controls speed press operation and die set-up time. Limit switch controls are operated by means of a simple hand crank. Inching-down handwheel permits the operator to move the platen as little as 1/16" at a time—a great aid to precise control in die-setting. A desirable safety feature is a thermostat control which will stop the press operation in the event hydraulic fluid should reach a critical temperature.

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American Steel Foundries

ELMES ENGINEERING DIVISION

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SPOT NEWS of Metalworking

- **"Operation Speedtool" is being started** on behalf of the Air Materiel Command by N. A. Lougee & Co., New York City, to find out actual current and future requirements of the Air Force for machine tools. Field representatives will visit machine tool builders having Air Force orders and subcontractors to these builders. Air Force prime and subcontractors also have been asked to help in this metalworking machinery control program.

- **These overtime policies have Defense Mobilizer Wilson's official blessing:** (1) premium overtime pay for work over 40 hr a week should be continued because otherwise productivity might suffer; and (2) eight-hour day and 40-hr week is most efficient. If necessary to work longer, hours should not go beyond 48 except in temporary emergencies.

- **Clear plastic "cans" will replace tin-coated steel cans** for packing Navy Ordnance's metal equipment and parts to assure freedom from moisture, fungus and damage in delivery. Reasons are: (1) saving of tin and steel; (2) plastic "cans" will be reusable; (3) men handling item which can be seen in plastic container treat it more gently.

Forging of titanium is now being done by Steel Improvement & Forge Co., Cleveland, which has orders for more than $1 million of forged titanium parts. Identity of customers and end use of forgings have not been disclosed.

- **A 50% increase in production of tungsten carbide** since beginning of Korean war still leaves producers far behind demand, the industry told NPA last week. There is no luck in finding a substitute for tungsten. Cobalt and molybdenum have been tried without success. U.S. is operating currently at deficit of 400,000 lb of tungsten a month.

- **New method of giving a stainless steel finish** to iron and steel products is to be marketed soon by Chromafuse Ltd., Aukland, New Zealand. Process, developed in Britain during the war, consists of fusing a stainless high chromium alloy into surface of iron or steel by penetrating skin of the metal with chromium. Skin becomes part of the metal and cannot peel off.

No spray booth is necessary and paint needed to coat the workpiece is held to minimum in new electrostatic spray painting system developed by Ransburg Electro-Coating Corp. Other advantage: rotating spray cone avoids use of compressed air.

- **New process for casting hulls of Army tanks** is under test by Army Ordnance Corps. Details still are classified, but Army hopes to cut production time in half with new process.

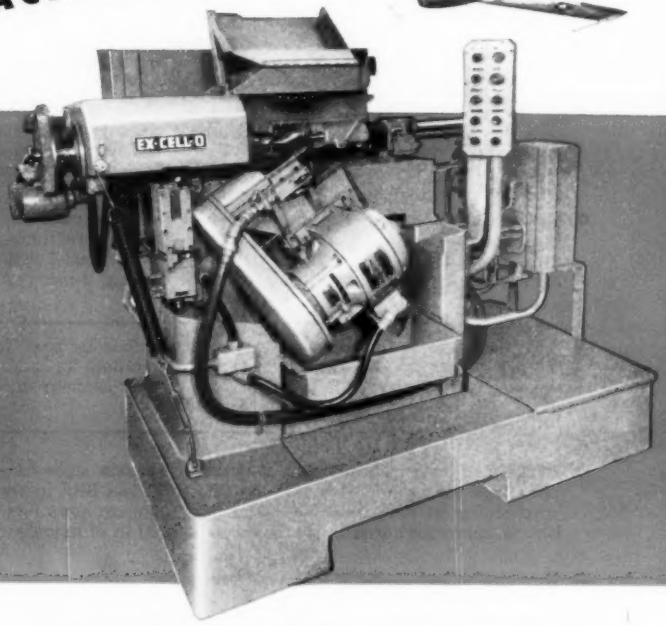
- **Gun tubes for Army Ordnance Corps will be made** at a new $32 million ordnance plant to be erected at Point Pleasant, W. Va. Plant will be operated by National Tube.

- **More than union shop is at stake in NLRB's handling** of AFL drop forgers' request for bargaining rights at Ford's Canton, Ohio, forge plant. Having decided that Ford-UAW contract can't stand in AFL's way because of faulty union-shop clause, NLRB is considering next step—granting AFL an election. Both Ford and UAW argued against it. Reason: It would break up industry pattern of company-wide bargaining for production workers, open door for other minority groups who are not skilled men to seek separate bargaining.

- **Osborn Mfg. Co., Cleveland, has begun a four-hour shift from 5:30 to 9:30 p.m.,** but workers may stay on longer if they wish. Object: to get trade school teachers and engineering students and other top men, but not white-collar workers. Youngsters are excellent candidates for sales and engineering staff later on. Shift runs five days a week, union rates prevailing.

EX-CELL-O

PRODUCTION-PROVED MACHINE MILLS JET BLADES



Above: **Jet blades of this type can be milled quickly, accurately, efficiently on the Ex-Cell-O Profile Miller.**

Right: **Ex-Cell-O Precision Profile Miller, Style 86.**

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EX-CELL-O'S COMPLETE LINE OF STANDARD MACHINES FOR FINISHING JET BLADES:

STYLE 85, FOR GRINDING THE ROOT FORM

STYLE 86, FOR MILLING THE AIRFOIL

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MILLS COMPLETE AIRFOIL, INCLUDING LEADING AND TRAILING EDGES—AUTOMATICALLY

Here is a production-proved machine for automatically milling the complete airfoil form (including leading and trailing edges) of jet engine compressor blades. An outstanding feature is the use of back rests that support the blade rigidly throughout each cutting stroke to prevent deflection of the blade by pressure of the milling cutter.

The Ex-Cell-O Precision Profile Miller, Style 86, is hydraulically operated and fully automatic except for loading, unloading and pressing the start button. The airfoil form is generated by a master cam made from the engineers' glass layouts. The work travels lengthwise across the milling cutter and is indexed after each cutting stroke, the indexing and cutting being repeated until the part has rotated 360 degrees.

For further information and detailed specifications on blade finishing machines write, wire or phone to Ex-Cell-O in Detroit.

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Washington

New military plans call for 4-5 million men in uniform. That's what President Truman meant when he told Congress our goals for military strength might be raised. Present goal of 3.5 million men under arms will be upped if Truman and the services can sell Congress on the idea. It will take legislation.

• • •

Big push for more manpower comes from the Air Force. It wants 1.8 million men, as against its authorized strength now of about 700,000.

Behind this move is a major shift in Air Force planning. Old concept of Air Force built around long-range, superbombers has been dropped. Emphasis now will be on faster, short-range bombers and fighters.

• • •

That means more aircraft—150 instead of 95 groups—and more men to fly and maintain them. So—if Congress okays the plan—look for big boost in volume of Air Force contracts. Estimated cost of 150 groups is $32 billion, against $19 billion for 95 groups.

Impact will be heaviest on materials and machinery. Aircraft makers will have to up their scheduled use of both substantially.

• • •

Truman will ask for a bigger Army and Navy, too. But neither is in for anything like the Air Force increase: two to four more Army divisions, a few more ships for the Navy.

Congress already is partly sold on a bigger Air Force. Many leaders believe the next war will be largely an air war and that we aren't nearly ready for it.

• • •

It puts new steam behind Universal Military Training. Services feel the draft won't get them the men fast enough. So the planning for UMT will be stepped up to get it in operation within a year—if possible.

Look for bigger draft calls meanwhile. If Congress provides the money, services can take up to 4-million men, the present statutory limit. They're held to 3.5 million now by available appropriations.

• • •

New CMP policy gives a break to small users of metal. National Production Authority field offices will process allotment requests that do not exceed these quarterly amounts: 100 tons of carbon steel, five tons of alloy, 500 lb of stainless, 4,000 lb of copper, 1,000 lb of aluminum.

NPA field offices have authority to grant 100% of requests of such users. And they can give advance allotments for a full year. That will virtually guarantee metal supply for small plants, let them set production schedules.

Tungsten looks like toughest nut among scarce materials. Consumption is running far ahead of supply, and Washington sees no hope of improvement in coming months. So look for tighter restrictions on use, even in essential industrial equipment.

• • •

Bottlenecks in output of industrial machinery now are the No. 1 concern of NPA. Machine tools still head the list, but others include mining machinery, food processing equipment, valves and fittings, electric motors, overhead cranes.

Lack of materials is holding up most equipment. Where possible, NPA is upping fourth-quarter CMP allotments. But there just isn't enough copper or alloy steel to free all lines, NPA says.

• • •

Wages will continue to rise with the cost of living. This is evident from the Wage Stabilization Board's approach to revision of wage-control policies. General idea is that all workers should be treated alike, whether or not they work under cost-of-living escalator plans.

Yet few increases will be justified under cost of living in the next few months. Under the General Motors escalator, no increase—or at most one cent—will be due the next quarterly adjustment, Sept. 1.

Wage stabilizers figure on a sixth-round of wage increases no higher than 5%. It will be climaxed by new steel contracts at the end of the year. John L. Lewis, of course, will try to do better in coal next spring.

• • •

Tool and die plants are getting special wage and manpower attention because of their importance to mobilization.

A tool and die industry study committee will advise the Wage Stabilization Board on how it might adjust its wage rules to ease the industry's manpower problem. WSB has received complaints of wage-control violations and labor pirating in tool and die shops in Chicago, Detroit, Dayton, Cleveland, New York, Philadelphia, Bridgeport and Indianapolis.

Charges of wage violations are being investigated by WSB for prosecution by a newly-established National Enforcement Commission. The easing of manpower problems through higher wages is being worked out by WSB in collaboration with Wilson's ODM.

• • •

A single, independent materials controls agency is in the making. Defense Production Administrator Manly Fleischmann soon will pull NPA out of the Commerce Department, merge it with DPA. At least parts of Interior Department's controls agencies will come into DPA-NPA later.

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WORLD'S LEADING MANUFACTURER OF PRECISION HONING EQUIPMENT

Detroit

If you dig deep into recent reports filed with a special Senatorial committee checking the steel picture you get a fascinating bird's-eye view of recent automotive buying habits and ordering. Each of the major three manufacturers reported details of their planning. Some of the highlights of industrial significance follow:

Machine tool ordering: In June Ford ordered $6 million in tools, 94.9% for use on defense, 5.1% on automotive work. As of July 1, 67.4% of total orders were for defense, 32.6% for automotive. Total cost was $132,750,000. Of the automotive machine orders placed in 1950, 22% are yet unfilled, representing most of the July 1 backlog.

General Motors: Of outstanding machine tool orders, 75% are for defense, 25% for civilian goods. The identical ratios hold true at Chrysler.

New facilities: Ford: Five projects. General Motors: 41 projects, costing about $245 million. Chrysler: Five company-financed projects for $33 million and two government-financed jobs for $35 million.

Steel inventories as of July 1, 1951: Ford: 126,423 tons, equal to 31 days' supply. General Motors: 364,904 tons, equal to 30.6 days. Chrysler: 93,774 tons; no day equivalent given.

Total production in second and third quarters of 1951: Ford: 438,899 and 361,396. General Motors: 783,471 and 640,608. Chrysler: 434,615 and 265,083.

Percentage of steel obtained on priority for second and third quarters: Ford: 2% and 12%. General Motors: 3.4% and 14.1%. Chrysler: 2.8% and 11.2%.

Facilities devoted today to defense work: Ford, less than 1%. General Motors, 10%. Chrysler, 10.14%.

• • •

The production figures above bespeak fairly well the near-term outlook. Down now to around 120,000 car and truck assemblies a week, volume is likely to remain thereabouts through August, maybe into September.

After September? Fourth quarter thinking is most murky right now. Best bet: Further reduction downward. Many dealers are beginning to complain most audibly about cars backing up.

The question immediately arises: Does this mean an end to the bloated car markets of the past few years? The answer is that it does—but that the new plateau won't be back at prewar levels. Before 1942 the car-truck total average for the 1937-1941 inclusive period was 4,241,137 (in the five years, 1925-29 inclusive it was 4,547,140). Detroit figures those levels are history, not precedent.

The new average level, the car researchers honestly believe, will lie closer to an average 5,500,000 or so a year. Reasons: Population increase, more cars per average family, more purchasing power, more uses for vehicles.

You can see the way they are backing their ideas with dollars. The expansions of the past few years are aimed at meeting the bigger market.

• • •

Tooling requirements for some of the changes planned for 1952 models are running late. Surprisingly enough, however, there's no great company pressure for delivery speedups. Apparently enough machines are late that the manufacturers are revising their plans.

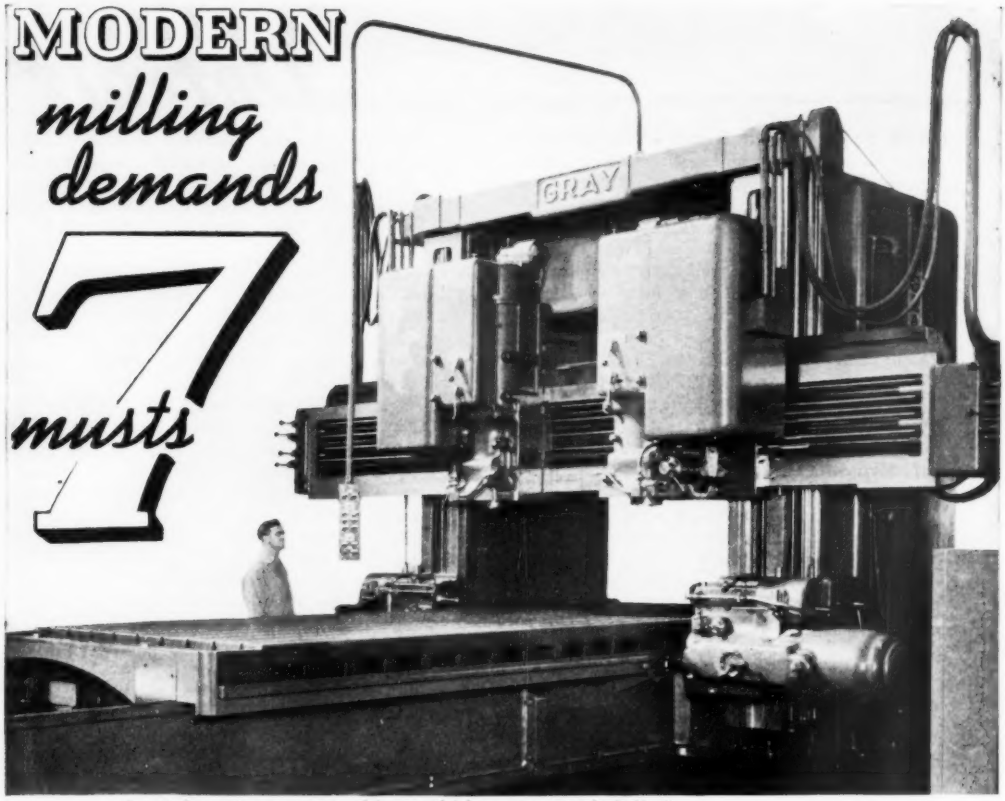
The new Buick engine, it would appear, will not be ready for a fall introduction—will either be put over to next midyear or to 1953.

The same holds true for Ford's overhead valve V-8 powerplant.

There are likewise vital machines missing for the new Dodge V-8, but the chances appear a little brighter that they'll arrive in time for 1952 installation—though it's not at all positive right now.

General Motors Styling Section technicians make a final inspection of GM's new experimental car, Le Sabre, just prior to its initial test running for auto writers at the GM proving ground last month. The car, with many extraordinary devices, was designed as a "laboratory on wheels"

MODERN *milling demands* 7 *musts*



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3. "Low hung" spindle drive to eliminate spindle torsional vibration under heavy intermittent cutting.
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Machine Tools

No beneficial effects have yet come from Charles E. Wilson's directive to government agencies to help get the machine tool industry off dead center. In fact, what's been done up to now has mostly created a lot of bad feeling.

• • •

First came GOR-15, with its complicated method of figuring prices. Speaking for the industry, Frederick S. Blackall, Jr., president of Taft-Peirce and first vice president of NMTBA, wrote members of Congress that builders are not in favor of this "blatantly transparent mechanism for control of profit."

He made the point that GOR-15 does not carry out Wilson's directive. It neither stimulates production nor provides incentive.

• • •

Then just prior to a hurriedly called meeting of the Machine Tool Manufacturers Industry Advisory Committee, General Services Administration issued the news that it would make available 30% cash advance with pool orders.

But there was a catch in it. The builder would have to certify that he could not get the necessary money from commercial banks or from government loan agencies. Moreover, he would be compelled to pay 4% interest for the cash.

GSA chose to interpret pool contracts as an underwriting operation rather than as bona fide government orders for machine tools. Under such interpretation, the law says that interest must be charged.

• • •

Industry spokesmen at the Industry Advisory Committee meeting said that expansion of machine tool productive capacity will require one or more of the following aids:

(1) Super-priorities for materials, facilities and tools; (2) more skilled labor and assurances that war plants will not be allowed to pirate employees of machine tool plants; (3) adequate financing to pay for expansion and to provide more working capital.

Committee members said that the present certificates-of-necessity program is not adequate. It allows quick amortization of only 75% of cost.

Subcontracting is not the solution for the machine tool shortage, the members stated. Less than one-third of total output can be obtained that way under most favorable circumstances.

Present machine tool building capacity is about one-third what it was at start of World War II, the committee revealed.

Some form of increased depreciation for tax purposes should be allowed for plant equipment used in two and three shift operations, committee members insisted.

• • •

It is freely admitted in Washington that if a satisfactory price formula can be agreed upon, other machine tool problems will be straightened out fast.

Builders still are pushing for base prices equivalent to those on business booked during the freeze period last December-January.

• • •

NPA says that no exact figures can be furnished on anticipated machine tool demand. Munitions Board has come up, however, with a figure of $2.9 billion. That is as near as it can guess how much machine tool output will be needed for armament tooling from May 1, 1951, on. The figure includes money for fiscal '52 and funds not yet used from previous years. Some of the money may not be spent until fiscal '53.

To this $2.9 billion should be added $800 million of accumulated defense orders, as of May 1. Also, further requirements may appear as tooling programs not now contemplated come up.

The point is that defense agencies are thinking in big figures in machine tool needs. At present, Pentagon believes that little if any of the anticipated total will be washed out.

• • •

Plan has been suggested of using idle facilities in Navy shipbuilding yards for making machine tools. Shop equipment at certain spots is particularly suitable; and the yards are not busy.

One prominent machine tool builder is exploring the idea of subcontracting work to one of the Navy shipyards.

The deal whereby Fisher Body Division of General Motors would get a big order directly from Washington for building machine tools is off.

Total of 44 pool orders were drawn up or in process as of mid-July. They covered 8881 machine tools valued at $155.5 million.

On that basis, GSA is prepared to make cash advances of about $46.6 million, as quickly as final contracts are approved and applications for advances can be put through.

Some machine tool builders still are indifferent toward pool orders and can't decide whether to accept or reject them.

There has been talk in Washington that the rule might be relaxed which specified that pool orders could be placed only up to the actual dollars on hand. But latest word is that the Bureau of Budget is standing pat on that rule.

• • •

For machine tool orders and shipments, see chart and figures on page 94.

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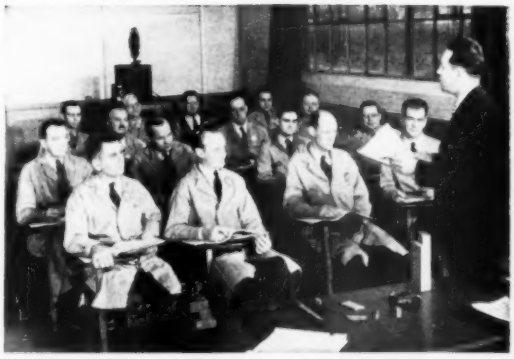

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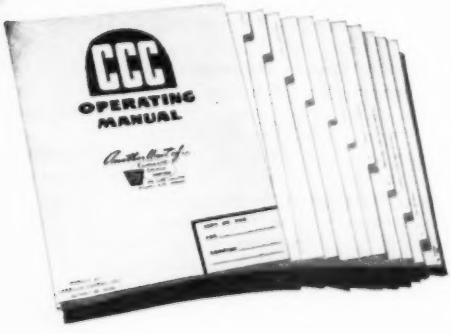
The Carboloy organization can also assist you in obtaining U. S. Office of Education 16-mm sound motion pictures. These films explain techniques of brazing, grinding, and application of carbide tools. Descriptive circular on request.



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4. Methods and Planning
5. Establishing Tool Standards
6. Application and Trouble-Shooting
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3. Grade Selection and Recommended Speeds
4. Brazing Carboloy Tools
5. Grinding Single-Point Tools
6. Grinding Chip Breakers
7. Applying Carboloy Tools
8. Trouble-Shooting
9. Tool Control and Method Selection
10. Inspection

Single copies of sections free; quantities at 10c each. Sections combined in one Manual GT-191 for supervisory use. Individual copies free; quantities at 50c each.

General Tool Catalog—GT-250—complete information on Carboloy Tools and Blanks and how they can help you get maximum productivity. Free on request.

Die Engineering Manual D-124—latest technical information on application, design, fabrication and maintenance of sheet-metal dies. Your copy sent free on request.

Grade and Speed Selector—easy-to-use calculator shows recommended speeds for cutting and recommended grade of Carboloy cemented carbide for any material to be cut. Ask for chart GT-218; price—50c.

Do's and Don't's Card GT-211—post these *free* cards near machines as constant reminder to operators of correct carbide usage.

Cemented Carbide Data for Defense Production

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Packed with valuable information on tool design applications for machining 90-, 105-, 120- and 155-mm shells. Available only to executives of companies with shell machining contracts. Specify size of shell when requesting.

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Tops in...
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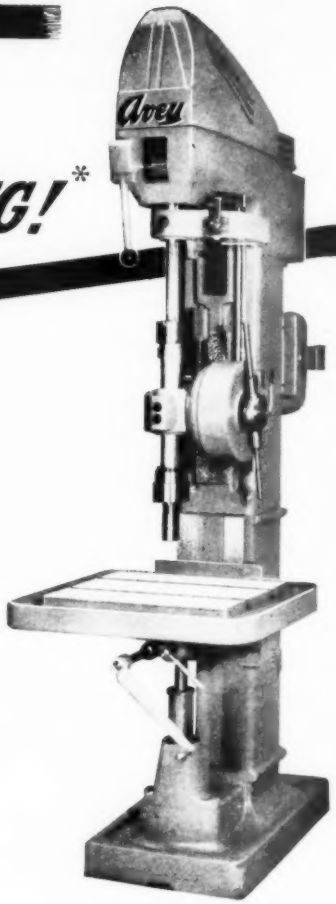

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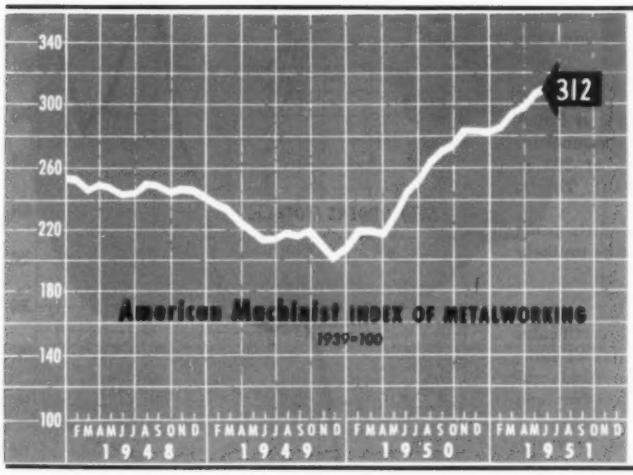
Gaging Metalworking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1948
1949
1950
1951

INDEX

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	JULY '51	JUNE '51(p)	MAY '51(r)	JULY '50
	312*	**310**	**309**	**266**
Machinery	303	302	244
Electrical Manufacturing	344	358	303
Automobiles, Trucks	243	245	256
Transportation Equipment	394	373	250
Other Metalworking	322	321	286

* Estimated (p) Preliminary (r) Revised

No Dip From High Rate Looked For

There is no telling what will happen in metalworking beyond the fact that a dip much below current levels is not expected.

Both durable consumer and consumer goods people are counting on a drop the last half compared with the first half. Yet hopes are high that early fall will bring an upturn in sales which right now could stand a shot in the arm.

As an offset, industrial machinery and capital goods of all kinds are still in terrific demand.

On top of that, defense production is growing. Though it may be behind schedule by a matter of months, it is a potent force in holding up the pace in metalworking over-all.

• • •

Just as a dip in the American Machinist index was looked for, it failed to occur. July is estimated to have been a bit above June, to everyone's surprise. Despite vacation shutdowns and lowered schedules in consumer goods, manhours worked have not been affected for Metalworking as a whole.

There are signs that the shortages anticipated in automobiles, appliances, and other consumer goods may be only a myth.

More steel may be at hand for civilian items in the fourth quarter than earlier indicated. It's possible that manufacturers may not be able to use all the steel allotted them.

This may sound like strange talk now. But it may not be so strange when October rolls around.

• • •

One large farm implement maker is alarmed by a spectacular drop in sales the past few weeks. It is searching for an explanation. Maybe late crops and bad weather in some farm states are taking their toll.

Farmers, on the other hand, may be sitting tight with the hope that prices will sink. They read the papers too and know what is going on.

• • •

The point is that metalworking companies are less sure of the trend the next six months than at any time since the Korean invasion. Result: Managements are more cautious in all their commitments. They also are more interested than they were in speeding up defense work. Appliance makers, for example, are taking up the slack with sizable armament orders.

• • •

Manpower seems to be bothering most metalworking firms more than materials. There is considerable grousing about CMP, but fact is that few plants have yet been cut back or shut down by lack of materials.

Quite a bit of trading in metals is going on among metalworking companies. A manufacturer with too much copper swaps it for tin, aluminum, cobalt, or steel.

Gaging Business

Defense spending is at a rate of $45 billion a year. Here's the rough breakdown: Air Force is getting $11 billion, Army nearly $18 billion, Navy $11 billion, and Mutual Defense and ECA around $5 billion.

• • •

There is good news about prices. Bureau of Labor Statistics price index of 28 basic commodities has declined from February peak of 392 to about 325 (August 1939 equals 100). This is a drop of 17%.

Industrial prices have dipped 2% from their peak. But fixed wage rates in industry make unlikely any further decrease.

• • •

Speedy amortization available through certificates of necessity has achieved its objective of stimulating industrial expansion. Authorized certificates at mid-July exceeded $8 billion and covered a total of 2679 facilities.

Look for a declining rate from now on, however. Government loans to any company bar it from getting a certificate.

• • •

Civilian employment of 61.8 million during June was 600,000 higher than in May, but only 300,000 up from June, 1950.

Unemployment rose seasonally in June to almost 2 million, from low of 1.6 million in May.

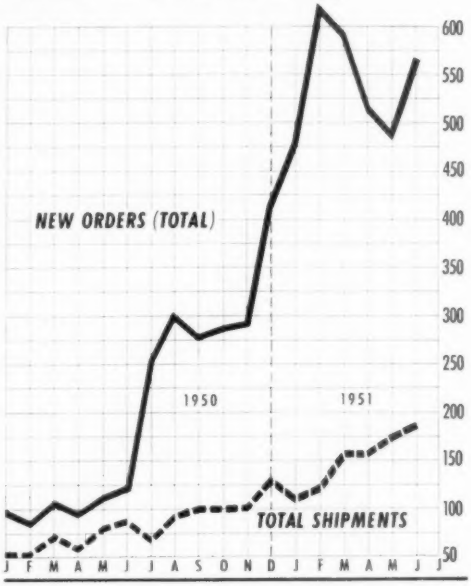
• • •

Housing starts in June jumped to 133,000, from 97,000 in May. January-June total: 575,000.

But don't expect more than 85,000 starts in July. Public housing starts made possible the big June showing. Local housing authorities rushed projects before end of federal fiscal year.

Net working capital of U.S. corporations is at a record level and still rising. Total at end of March (which was the last count) was $77.8 billion.

Machine Tool Orders Rise Sharply



	New Orders	Foreign Orders	Shipments
1951			
Jan.	475.4	61.3	114.3
Feb.	615.5	78.2	123.8
Mar.	590.3	102.1	158.9
Apr.	516.1	66.1	157.7
May	483.0	35.7	175.1
June	p567.0	p57.8	p183.5

Source: National Machine Tool Builders' Association

That is a gain of $2 billion over final quarter of 1950 and $6.3 billion over same time year ago.

• • •

Small metalworking companies may use foreign steel and no longer consider it part of their allotment through CMP. That's why imports of finished steel are up about 10 times.

WEEKLY BUSINESS INDICATORS

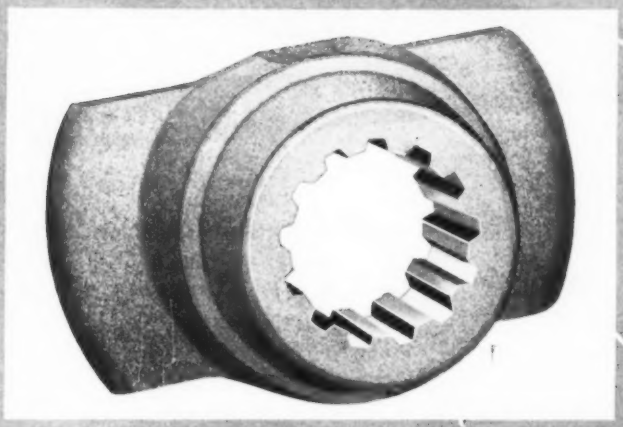
	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1923-1925 = 100)*	232.0	230.7	220.0
Steel ingot production (thousand tons)	2,027	2,037	1,893
Electric power output (million kilowatt hours)	6,974	6,739	6,006
Production of automobiles and trucks	128,017	117,747	187,339
Engineering construction awards, (Eng. News-Record, millions)	$251.9	$361.1	$252.5

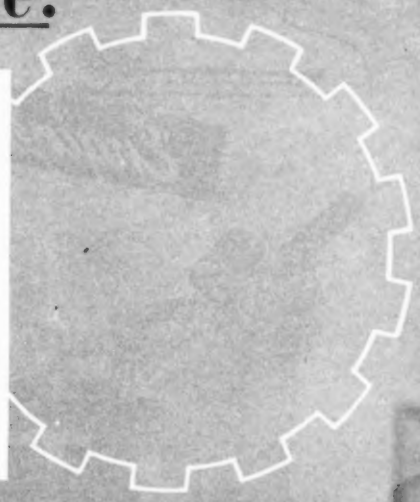
QUARTERLY BUSINESS INDICATORS

	Latest Quarter	Preceding Quarter	Year Ago
Gross National Product (billions)*	$320.0e	$313.9	$271.6
Expenditures on new plant and equipment (millions)	$6,420r	$5,160r	$4,330
Profits after taxes in primary iron and steel industry (millions)	$253	$257	$199
Profits after taxes in machinery industry (millions)	$291	$288	$190
Profits after taxes in electrical machinery industry (millions)	$164	$215	$129
Profits after taxes in motor vehicles and parts industry (millions)	$265	$255	$322
Motors and generators new orders index (1936 = 100)	700e	780r	334

* Seasonally adjusted. e Estimated r Revised

Lower Cost-per-piece:





BROACH REDESIGN *cuts tool costs—boosts life*

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Redesign of the tools for this spline broaching operation resulted in a 24% reduction in original tool cost, 22% increase in the number of sharpenings per tool as well as a 14% increase in the parts produced per sharpening. The result in terms of cost-per-piece was a net saving of $450.00 per month.

Slight savings in production and sharpening time were effected due to the fact that this redesigned tool was shorter than the original. However, in many cases lowest cost per piece can be achieved only through redesign which increases tool length . . . a decision which is best made for each application by qualified broach specialists.

This spline operation is but one typical example of how Detroit Broach specialization in broaches and broaching tools pays off. Such specialization provides a back-log of experience which is unparalleled as the basis for sound recommendations. Whether you are considering conversion to broaching or more for your money on present broaching operations, don't fail to consult Detroit Broach. We will be very happy to supply actual cost and production data.

DETROIT BROACH CAN CUT YOUR COST-PER-PIECE

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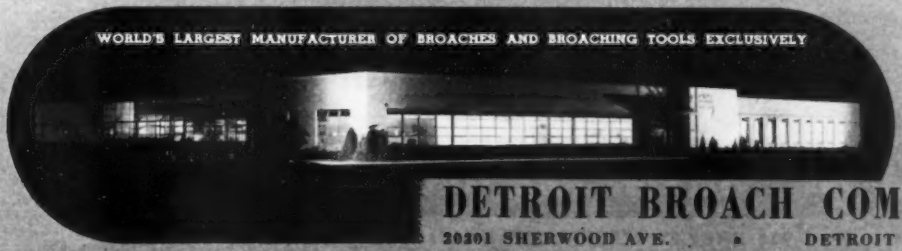

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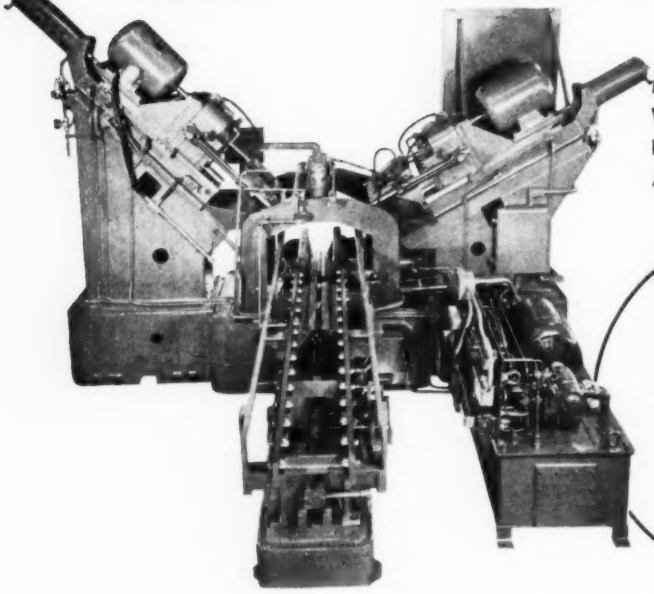
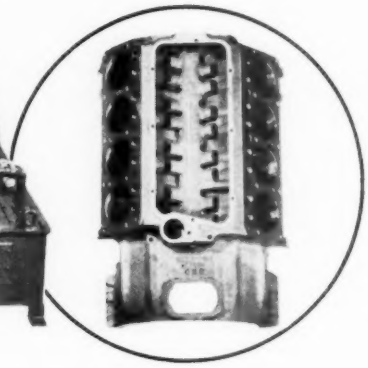


MORRIS *Mor-Speed* MACHINE WIRE BRUSHES CYLINDER BORES and TAPPET HOLES AUTOMATICALLY . . . .



"Untouched by human hands," this massive V-8 engine block is automatically loaded, clamped, wire brushed on both banks, then automatically unloaded to the production conveyor.

Installed in the plant of a leading auto manufacturer, this Morris Production Machine speeds the production of a new super-powered engine. In the view shown here, the left hand hydraulically operated angular slide carries four wire brushes for the cylinder bores. The other angular slide carries eight brushes for the tappet holes. Automatic 180° indexing allows alternate brushing of both cylinder banks.

This machine illustrates the versatility of Morris Engineers in applying production methods to time and labor consuming jobs. If your work requires numerous operations on a mass production basis, your inquiry is invited. No obligation.

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American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

What Do Your Employees Think of You?

Do you ever wonder what your employees think about you and about their jobs?

Caterpillar Tractor Co. set out to get the answer. It had the Survey Research Center of the University of Michigan conduct a far-flung survey among its workers. And it has come up with some provocative statistics.

What's more Caterpillar has published the results in its newspaper for employees. It did not flinch when the vote was on the critical side. It printed the full facts.

LET'S LOOK through the survey and see what happened. Some 48% of employees voted that they liked best at Caterpillar the hours and shift they were on, and 47% said they liked best the people.

On the other hand, the rate of pay and chances for promotion were the two things that workers liked least. Almost three out of five employees were very dissatisfied or fairly dissatisfied with the way production standards are set.

Half the workers replied, "I set my own pace," in answer to the question, "What is most important in setting the pace for your work?" Some 64% said that they would rather stay where they are than move if they had a chance to do the same work at same pay in another group.

Sixty percent voted that improvement is needed in the policy of replacing old machines; and 53% thought that improvement is needed in maintenance of machines.

THE VAST majority of employees felt that they were a part of their own work group. But 68% confessed that they worked only "about as hard as most of the others in the group." A substantial percentage (47%) thought that the present union has made Caterpillar "a somewhat better place to work."

Foremen got a vote of confidence as the result of a series of questions. But they did not come off unscathed. Employees believe that foremen can do a better job of keeping workers informed.

Caterpillar, on the whole, made a good showing as a place to work. Forty-six percent said that it is a good place, but there are a few things that should be changed. Twenty-four percent voted it a fairly good place, but said that quite a few things should be changed.

THIS REMARKABLE survey would have little meaning unless something were done about the things it shows that employees don't like or don't understand.

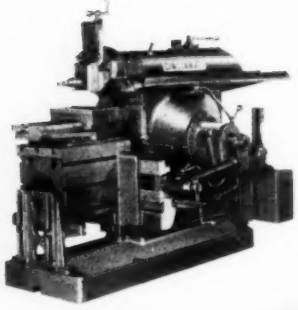
Caterpillar's president L. B. Neumiller pledged to the workers, in the published survey, that an effort will be made to eliminate causes of justifiable criticism. If the criticism arose from a lack of understanding of the facts, greater effort will be made to explain the situation.

Caterpillar's frank and open method of getting an unbiased appraisal of itself from its employees commends itself to other managements. We hope that other metalworking companies will let their workers tell them about the management's virtues and faults; then remedy faults.

There is no better way of winning the confidence of workers and cementing good relations between management and employees.

Burnham Finney

Shaping a BIG job...



Internal shaping bearing seats in this 5500-lb. steel plate to a tolerance of .001 indicates the accuracy and rigidity of Cincinnati Shapers.

The rapid and accurate metal removal, and the low-cost setup for shaping this 12′ steel plate on the sturdy Cincinnati table, give low-cost operation.

The unusual flexibility of change from job to job in minimum time and with minimum costs of tooling and fixtures also has made the Cincinnati Shaper the handy man of industry.

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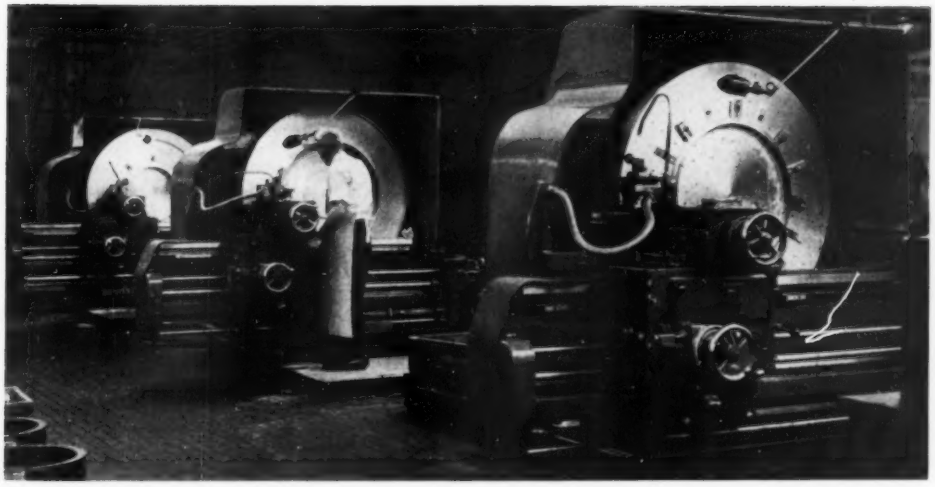


Three of the new T-lathes installed at Pratt & Whitney Aircraft. The design was first described in *AM*, Dec. 11, '50, p. 186, is essentially a light-duty machine with large swing, excellent for second operations on boring-mill jobs and for large-diameter work on which light cuts are to be taken.

American Machinist ARMAMENT REPORT

NEW MACHINE-TOOL TYPES MAKE AXIAL-FLOW JETS IN QUANTITY

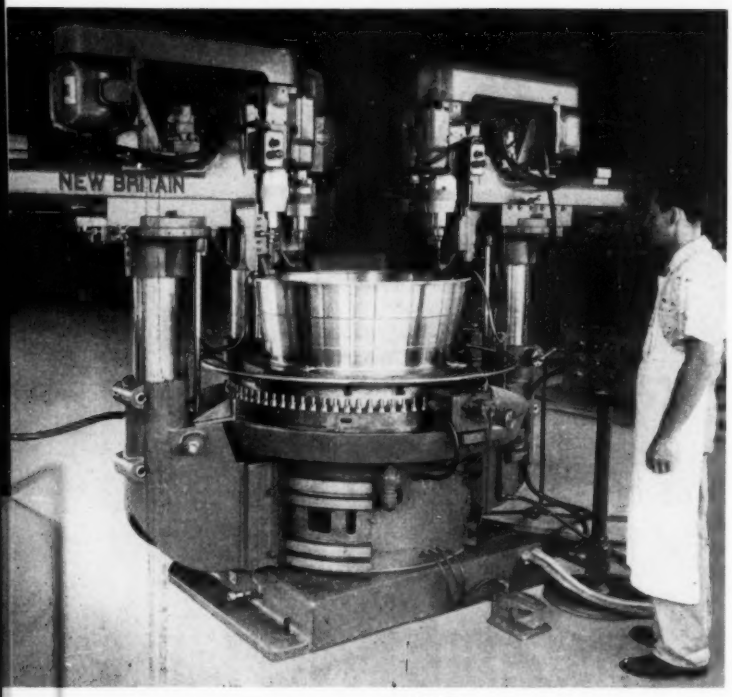
More efficient machining and maximum flexibility result when Pratt & Whitney Aircraft and toolbuilders' engineers team up... Five special machines developed in cooperative programs

BY ARTHUR A. MERRY, Chief Tool Engineer
PRATT & WHITNEY AIRCRAFT
Division of United Aircraft Corp. East Hartford, Conn.

NEW DESIGNS of axial-flow gas turbines of extremely high power, recently developed by Pratt & Whitney Aircraft, posed difficult production requirements not encountered with the relatively more simple centrifugal-type turbojets built since 1948. New tooling methods and machines were required to cope with these problems, created by much tougher materials, components of large diameter and thin wall section, closer tolerances, and much higher production rates.

Our tool engineers began an intensive search for more efficient machining methods that would retain maximum flexibility. As a result, we have fostered the development of a number of wholly new machine tools, and have applied some major improvements in production techniques.

Collaboration with designers from several well-known machine-tool builders, as a part of the production-engineering program under my direction and under supervision of J. L. Bunce, factory manager at our East Hartford, Conn., plant, has resulted in the five new tool types here disclosed. All are aimed at speeding production by combining operations, increasing operator efficiency, and improving quality of finished parts. They also possess unusual flexibility and "universality"—and some actually cost less than the standard machine tools that otherwise would have been required. All can produce a wide variety of shapes and sizes of parts, and setups can readily be modified to meet design changes.



THREE-HEAD FLEXIBLE DRILL HANDLES LARGE RANGE OF HOLE PATTERNS

AXIAL-FLOW gas turbines of Pratt & Whitney Aircraft design are assembled from a number of circular elements, bolted together. Because of this, the turbine builder is called upon to execute a large variety of drilling patterns, spread over diameters ranging up to 48 in., and in some cases providing as many as 196 holes.

Multi-spindle drilling machines were not practicable for this work, for several reasons. Volume of production did not warrant the outlay for specialized machines capable of handling the whole range of patterns; even if it had, a multi-spindle machine would not have been practical because of the time that would be lost changing drills. Most of these components are stainless steel, and the number of holes drilled between sharpenings is very low, in stainless, as compared with low-carbon steel.

Furthermore, there was no standard drilling machine on the market flexible enough to deal with such a wide variety of hole patterns. And the cost of making drill jigs for these large rings would have been a major expense.

To overcome this, our production engineers conceived a solution which New Britain Machine Company executed: a three-head, adjustable-spindle, circular drilling machine, which is capable of handling any drilling pattern called for, without expensive drill jigs and fixtures. (A fourth spindle is soon to be added to the new design.) The machine can drill, ream, and countersink at one setup of the part, with only one tool in each spindle. In some cases, it can handle two different components at one time.

The machine, is in effect, universally tooled. All that is required is a locating diameter and a checking ring, to make sure the operator puts in all the holes required. Changeover from one hole pattern to another is a matter of a few minutes. Conservatively, the saving can be figured at more than $1000 per jig.

The operator can easily see that the drills are kept sharp, so they are worked to their fullest capacity, yet changed quickly as soon as they become dulled. This feature is especially attractive when it is recalled that stainless steel and other gas-turbine materials tend to work-harden at an alarming rate the instant a tool doesn't cut freely. In fact, one of the serious objections to the use of a multi-spindle drilling machine was that it would be very easy to ruin a set of drills and several components before a dull drill would be discovered. With the new drilling machine, the instant that a drill isn't cutting properly, it will immediately be detected by the operator and can be changed in a matter of seconds. Thus, saving in downtime for tool changes is considerable and output is increased.

Table Easily Rotated

The 46-in.-dia. table is mounted on a large spindle with two independent radial ball bearings, the outer bearings supporting the table nearly to the outer edge. As a result, the table can be rotated with the lightest touch of a finger; a large handwheel is fitted for the convenience of the operator. The table is locked in working position for a particular drilling operation by means of a shot bolt (front center) operated by an air cylinder.

The three drilling-spindle supports can be moved about the circular base through approximately 300° of the perimeter, sliding on the two steel guide-ways, so spindles can be located at any desired points.

By swiveling the heads on their respective supporting columns, and by running the radial arms in or out in the holding brackets, any desired setting can be obtained.

A single control pedestal contains the start-stop and feed and retract switches for all three spindles.

Changeover from one hole pattern to another can be made in a matter of 15 to 2 min, provided the multiple falls within the range of the index pins which can be plainly seen around the perimeter of the table. These index pins are initially spaced by means of ground circular disks of equal diameter, to give the correct chordal distance for the required number of holes. When odd locations are needed, the location of the index pin is determined by V-links.

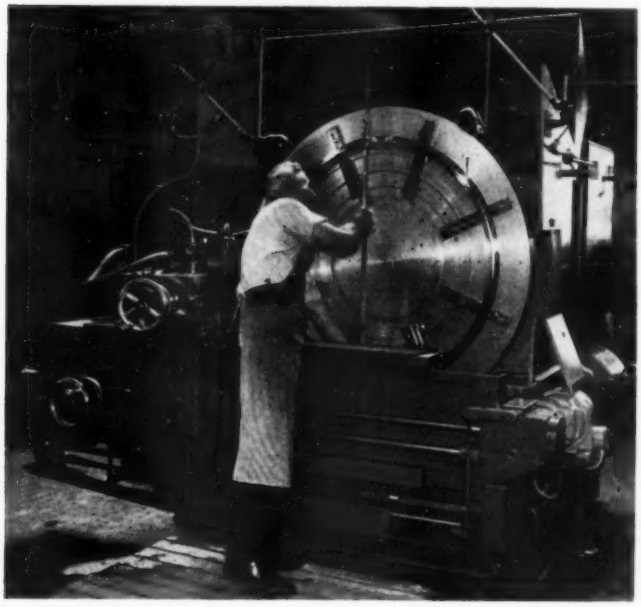
Operation of the machine is extremely simple. To rotate the table from one locating pin to the next, the operator merely retracts the shot bolt by stepping on the treadle

(front, low down) which trips the air valve; moves the table to the new location, stopping at the approximate center of the next index pin; then releases the shot bolt which thereupon moves in slowly to engage the locating pin without jarring the table or unduly straining the pin.

The left-hand spindle spot drills to a depth sufficient to create the chamfer. When that point reaches the next spindle (shown in extreme rear) that spindle drills the remainder of the hole, then finally the right-hand spindle reams. The part shown is a compressor casing.

The new drilling machine was designed to drill and ream to within 0.005 in. of the true location; in checking out, the machine has performed to within 0.002 in.

Future development calls for addition of a horizontal drillhead and also for a broaching spindle for certain holes whose angular location must be kept extremely exact but which must have clearance to allow for high temperatures radially. These slightly elongated holes can then be broached at the same time without removing the part from the table.



T-BED LATHE ENDS CLIMBING TO WATCH WORK, CUTS INVESTMENT

MACHINING thin-walled stainless-steel rings of very large diameter for turbojet nozzle vane rings, blade shrouds, and tailpipes posed a difficult problem. Diameters to be handled—running up to 48 in.—required a lathe capable of 60-in. swing, a size normally built only for heavy-duty work. But the rings are shallow and of thin wall section and cuts to be made are relatively light and precise, so the large horsepower of the conventional heavy-duty lathe was not actually needed. What was really wanted was the range of a large car-wheel lathe with the sensitivity of a toolroom lathe.

These requirements, with a suggestion for a revolutionary lathe layout, we took to Lodge & Shipley, whose designers carried the idea onward. The result: a right-angle chucking lathe with a T-shaped bed. That is, the section on which the carriage is mounted is at right angles to the center line or at any angle to it. Hence, the new lathe can handle facing, straight or taper turning, or boring, and can be purchased with a contouring attachment.

Five of these new T-bed lathes have been installed, and Lodge & Shipley is now supplying them to other industries. As second-operation machines to receive roughed-out work from a vertical boring mill, they are an ideal answer to the current shortage of mills.

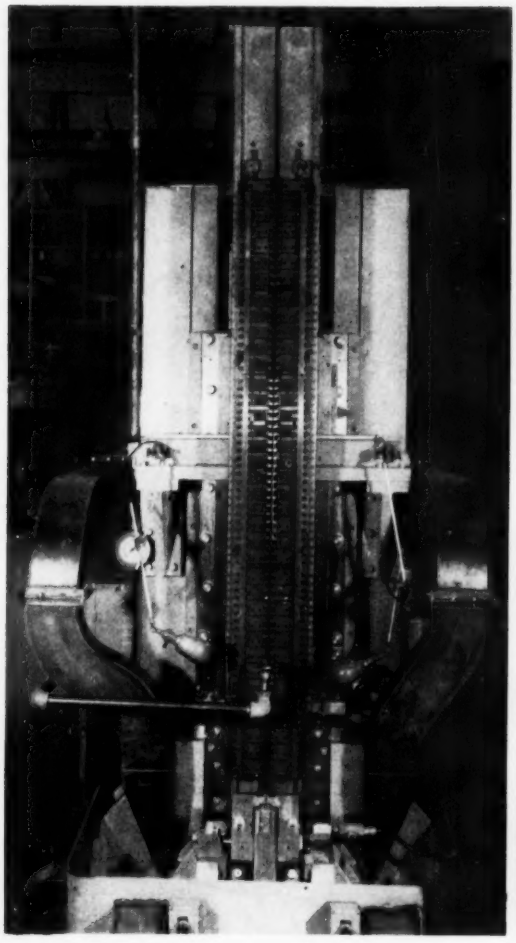
The new lathe has a standard 25-in. heavy-duty headstock with 11½-in. hole. This permits chucking pieces with a shaft or other extension. The bulk of the parts to be made, however, are simply clamped to the large faceplate—a 54-in.-dia. aluminum casting, 5 in. thick (for low moment of inertia, hence easier starting and stopping). Work is held to this faceplate by means of mild-steel straps and studs, located in the ⅜-in. holes drilled in the plate, or by chuck jaws bolted to the aluminum plate.

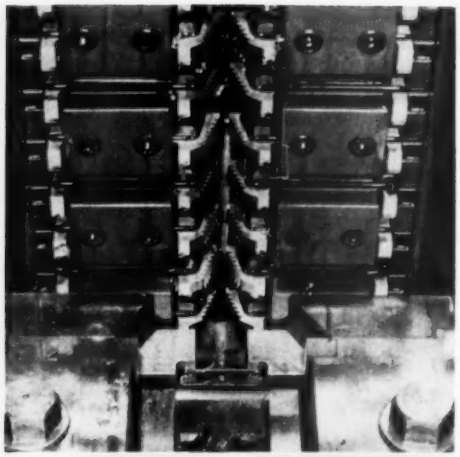
Controlled from Apron

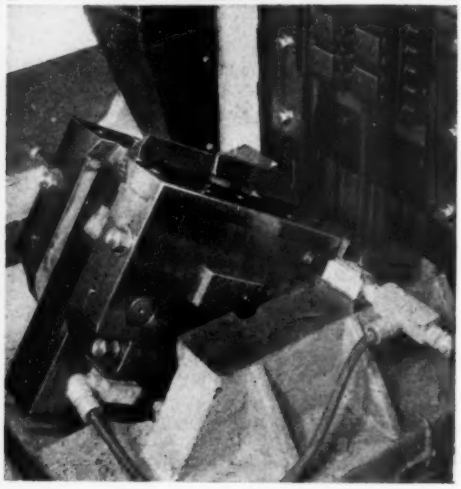
Highly sensitive controls permit tolerances up to 0.001 in. to be obtained easily. All operations are controlled from the apron, including selection from 25 spindle speeds (ranging from 4 to 225 rpm) and from 55 feed rates for the carriage and compound rest (from 0.001 to 0.0064 ipr).

Many desirable features are provided by the new design. It is much easier to load and unload than standard lathes, because there is not the usual long bed extending beyond the workpiece. Furthermore, the operator can stand much closer to the work, making it easier for him to follow the progress of the cutting and to make precise measurements of the work as it progresses. We get away from the undesirable practice of many operators of climbing up on the lathe to measure the cut.

The new design saves nearly half the floor space that would have been required by a standard 60-in. swing lathe—a real advantage in increasing productive capacity of our existing floor space. Further, it costs several thousand dollars less than comparable 60-in. lathes.







SETUP FOR PRODUCING FIR-TREE ROOTS TAKES BROACHING A LONG STRIDE FORWARD

SEVERAL steps forward have been taken in revising the procedure for broaching the "fir tree" roots of turbine blades. One of these is in machining both sides of the blade-root at one pass, another is in introduction of individual teeth in the broach (first mentioned in *AM*, Aug. 11, '49, p. 96). Both increase the rate of production and at the same time increase the life of the tools.

Previous method of machining these roots was to mill the "limbs" on one side of the "tree," then index the part and mill the limbs on the other side, using the same cutter. But, this gave neither the extreme accuracy required for these surfaces nor a low enough production time. So our tool engineers have gone to a broaching-and-grinding combination which gives the gage-like accuracy of finish necessary for these blades, and at the same time is less costly.

Broaching of both sides of the root at one pass is done on a Lapointe 15-ton 90-in. vertical broach. Setup differs from usual broaching practice in that each tooth in the body is separate.

The conventional multi-tooth setup imposed certain limits: You could not back off or relieve the teeth to adjust the amount of cut, because the teeth were so closely spaced. This can now be done. Moreover, you could not make the multiple-tooth section as hard as the individual teeth can now be made. Furthermore, it has always required a high degree of skill to prepare broach sections with multi-teeth. Now, however, we obtain the desired accuracy through controlling the form of the grinding wheels which dress the broach teeth—thus the teeth can be ground by a workman of average ability, instead of a man of exceptional skill.

This setup represents another departure in breaking away from the

old idea that several teeth should be in the cut at one time. This idea is obsolete, we think, because today's machines are so constructed that the ram guides give firm alignment of the stroke, and the teeth can be used for their primary function—cutting.

With the teeth spaced more widely than in the older method, greater chip clearance is provided.

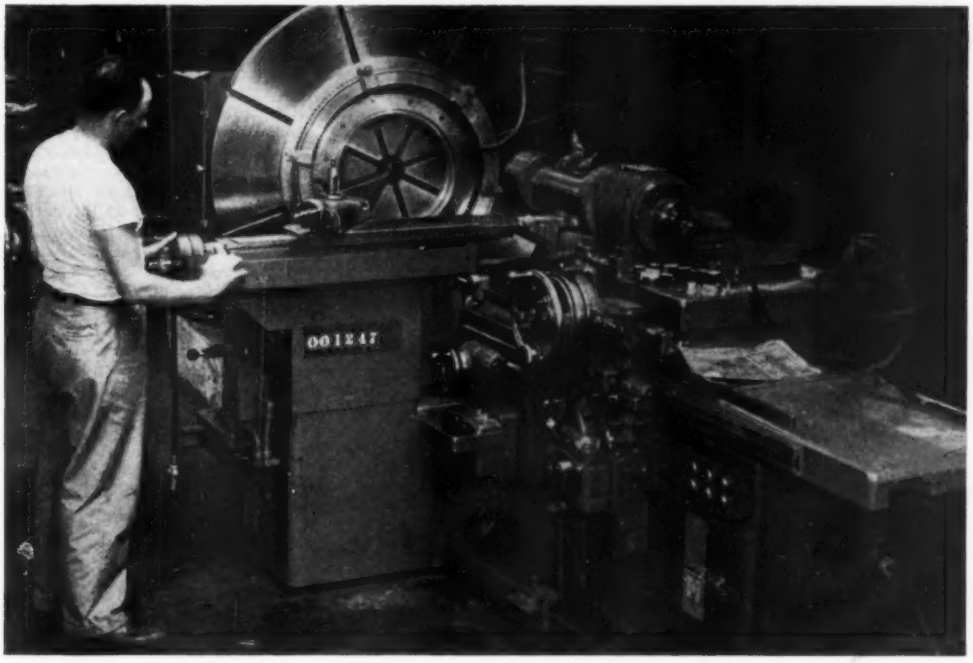
Because of the character of the metal used for these particular blades, roots are broached 0.005 in. oversize, the remaining stock being removed on a surface grinder, whose wheel is dressed with a Diaform dresser, at a 10-to-1 ratio, or on a two-wheel Excello or J & L grinder, designed for this special operation.

By this combination of broaching and grinding, desired accuracy of finish is obtained, yet the operation is less costly than the old method of milling.

We expect to make further advances with this method of broaching using individual teeth, as mass-production of Turbo-Wasp jet engines proceeds, until it is broaching all surfaces of the blades for both compressors and turbines (except the airfoil surfaces). Separate teeth permit many setups previously impractical with its conventional multi-tooth sectional broach.

A particularly attractive feature of this use of individual teeth is that each tooth can be used completely up. This means an appreciable saving in the consumption of HSS, of primary significance now that the nation is facing shortages of tungsten and cobalt. This advantage, combined with the improvements in surface finish and machining time, made it well worth while.

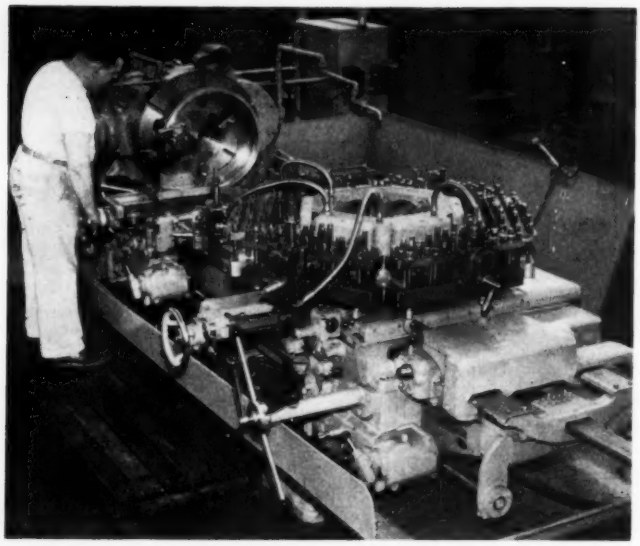
A still further step is the use of carbide tips on these individual broach teeth. This is really the motive behind developing individual teeth. As the materials used become more difficult to machine, the need for carbides and the "know-how" of grinding them clearly becomes more urgent. We are not yet ready to talk further about this, however.



LATHE HEAD GRAFTED ON GRINDER GIVES TWO OPERATIONS AT ONE SETUP

LARGE NUMBERS of frail, large-diameter, thin-walled rings and weldments, closely controlled for size and surface finish, can best be produced on a grinder. But subsequent operations, such as recessing and chamfering, must usually be done later on another machine tool, such as an engine lathe or a boring mill. Cuts are slight, and the rings are light, so concentricity would be a problem in a second setup.

So we conceived the idea of mounting the turning slide from a Monarch engine lathe on the bed of a Heald No. 174 internal grinder. Thus the turning operations can be performed without disturbing the setup. The machine works entirely to our satisfaction, and makes a considerable saving in capital investment, because a lathe capable of swinging a ring as large as 48 in. in diameter would be a sizable purchase. All that is needed here is the delicate touch of a smaller engine lathe, which the added cross-slide provides.



10-POSITION TURRET LATHE HAS TWO SLIDES, EXTRA RIGIDITY

TO TURN parts in quantity for turbines still in the design stage requires highly flexible tooling. To attain this result on turbine and compressor disks, we asked Jones & Lamson to build a new lathe design which would combine all the flexibility of the J & L turret lathe with plenty of extra rigidity for easy carbide-machining of heat-resisting alloys. The result is this rigid J & L 10-B cross-sliding turret lathe, which has flexibility, and more-or-less-permanent tooling.

Back before World War I, J & L made the Harkness turret lathe, with a heavy, flat, sliding head having an abundance of toolholding screws. This machine revives that design and applies it to a modern machine.

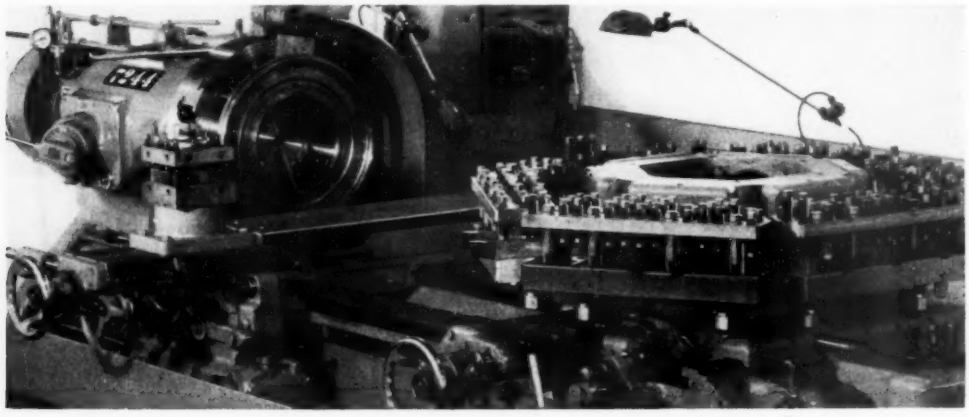
A small 4-way turret toolpost on the slide nearest the head holds turning tools, while the larger 6-way turret is mounted on a heavy-duty carriage beyond it. Thus ten turret positions are provided.

Extra support for the tools in the big turret is provided by a hardened steel plate which spans the gap in the carriage under the 4-way toolpost and abuts against its base. Toolholders on the big turret carry hardened steel setscrews projecting downward, adjustable so they rest on the hardened steel plate when the big turret is moved up. Thus tools are rigidly supported all the way down to the bed, and there is no overhang.

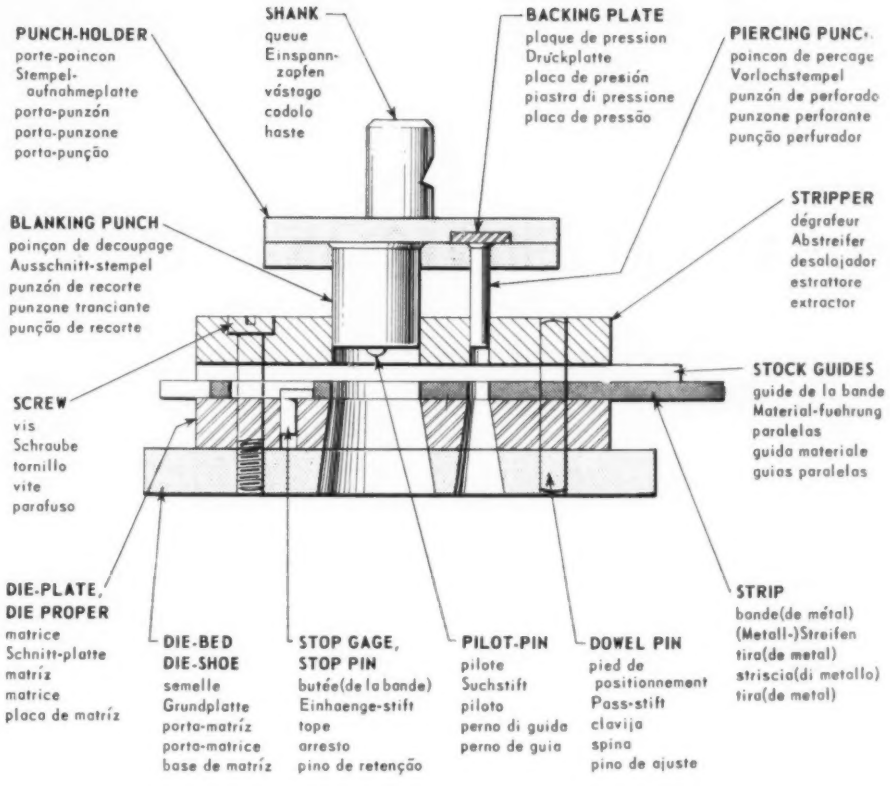
The large toolholding capacity of the old Harkness machine is regained in the 10-B because the six sides of the big turret have a large number of strategically placed holding setscrews, combining maximum rigidity with flexibility.

Single-point tools are positioned in the toolholders by templets corresponding to contours of the disks to be cut. With an assortment of templets, we figure we can machine 16 different sizes of disk on both sides. Further, we can set up at one time all the tools necessary for machining both sides of two sizes of disks. (In the photograph, a compressor-disk forging is being plunge-cut and faced simultaneously.)

In our opinion, it will be necessary to resort to machine tools with this degree of flexibility until production quantities grow to levels high enough to warrant more-specialized single-purpose machines.



Withdrawal of the small toolpost positions the hardened-steel plate on this carriage, so setscrews projecting downward from the toolholders on the big turret can rest upon it.



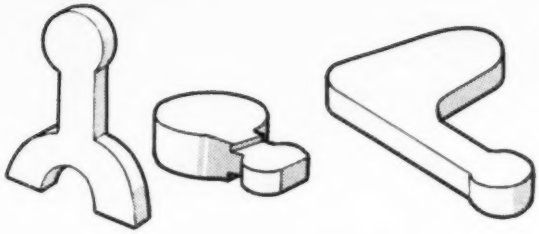
Press-tool, die: matrice (*Fr.*) Stanz-Werkzeug (*Ger.*) matríz (*Span.*) stampo, ferro da trancia (*Ital.*) matríz (*Port.*)

Watch Your Language for Die Components

BY FEDERICO STRASSER

READERS of *American Machinist* in various parts of the world, also English-speaking die shops that receive articles or prints in foreign languages, will appreciate the six-language nomenclature given above. These terms have been carefully checked with die-maker friends of various nationalities and from my own multilingual knowledge of European practice.

The English word in each case is followed by foreign-language equivalents in this order: French, German, Spanish, Italian and Portuguese.



Shaper work includes far more than simple rectangular blocks in shop of Clark E. Nixon, Ferndale, Mich. These pieces are shaped to correct cross-section in slabs, then are sawed to width

SHAPERS CUT CURVES AND CONTOURS

Intricate shapes are produced on shapers in a small Detroit shop.

Good tooling and methods result in economical production of small lots

BY CHESTER S. RICKER
DETROIT EDITOR

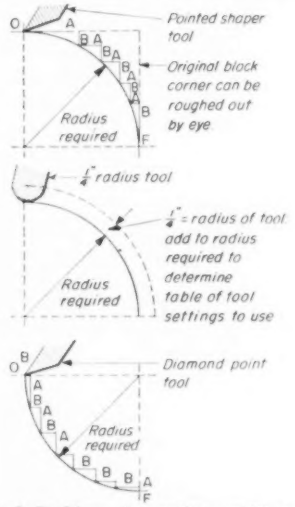
FEW PEOPLE realize what a versatile machine the shaper is. Originally intended for squaring rectangular blocks for dies and fixtures, the shaper actually is capable of machining many other forms. In a small shop in Detroit, for example, shapers are employed for radii from ⅛ to 3 in.

This shop, the Nixon Steel Block Service, Ferndale, Mich., specializes in shaper service, and its owner, Clark E. Nixon, has developed tables for tool position for both concave and convex shapes. With this method, Nixon cuts a ½-in. radius on the corner of a steel block in less than 10 min. While not suited to high production, small lots often can be produced economically in this way.

For shaping radii or circular grooves, Nixon works directly from his table of tool positions. He feeds the cutting tool around the approximate curve, using but two movements, one vertical, the other horizontal. Readings are taken from the dials on each feed handle.

The actual procedure is simple and quick: Referring to the accompanying illustration, *O* is the starting point of the cut. To set the tool, first touch the top of the work at *O*. A paper feeler helps, but remember to allow for its thickness in setting the dial to zero. About 0.003 in. is right for most letter-paper. Then clear the block and feed down until the last figure in column *B* (see Table 1) shows on the down-feed dial. Bring the cross-feed dial to the value of *A* at the bottom of the table when the tool touches the block at *F*. Now raise the tool until dial *B* is zero and feed across the work until dial *A* also is zero. The tool should just touch the block at *O*. Now cross-feed to the first *A*-value in thousandths and then feed down

HOW TO CUT RADII ON A SHAPER


Pointed shaper tool
Original block corner can be roughed out by eye
Radius required
¼" radius tool
¼" = radius of tool add to radius required to determine table of tool settings to use
Radius required
Diamond point tool
Radius required

Tool Positions for cutting radii are established by feeding tool across (direction A) and down (direction B) by amounts shown in table of tool settings for radius required. When radius tool is used, add radius of tool to radius required to determine table of tool settings to use. Example: 5/16 + 1/4 = 9/16-in. table to be used

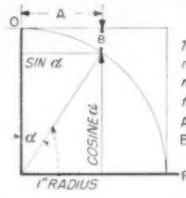
table 1 .. TOOL SETTINGS FOR CUTTING 5/16-In. RADIUS

SETTING A	SETTING B
0.000*	0.000*
0.050	0.004
0.080	0.010
0.110	0.020
0.130	0.028
0.150	0.038
0.160	0.044
0.170	0.050
0.180	0.057
0.190	0.064
0.200	0.072
0.210	0.081
0.220	0.090
0.223	0.092
0.232	0.102
0.241	0.112
0.249	0.122
0.256	0.132
0.263	0.142
0.268	0.152
0.274	0.162
0.284	0.182
0.292	0.202
0.302	0.232
0.308	0.262
0.312	0.312

*When tool is at start, Position O.

Note: Settings are approximate, having been established from 10X drawings rather than from tables of trigonometric functions.

HOW TO FIGURE TOOL SETTINGS FROM TRIG TABLES



Trigonometric method of figuring table
A = sin α
B = 1 − cos α

table 2 . .

	FOR 1-in. RADIUS					FOR ½-in. RADIUS	
	Tool Setting A		Tool Setting B				
Angle	Sine	Setting A (in.)	Cosine	1-Cosine	Setting B (in.)	Setting A (in.)	Setting B (in.)
6°54′	0.12014	0.120	0.99276	0.00724	0.007	0.060	0.003
10°23′	0.18023	0.180	0.98362	0.01638	0.016	0.090	0.008
13°53′	0.23995	0.240	0.97079	0.02921	0.029	0.120	0.014

Table of tool settings can be computed from natural trigonometric functions. For 1-in. radius, *A* and *B* settings can be established directly. For other radii simply multiply these settings by the correct decimal. For example, for ½-in. radius, multiply by 0.5

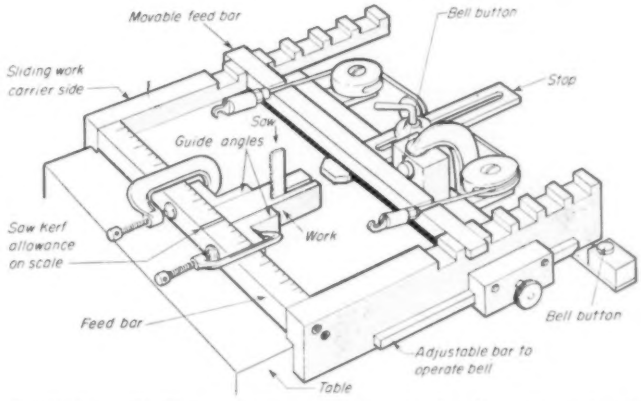
the amount *B* shown in the table. Continue down the table, cross-feeding first and then down-feeding. When finished, the increments are so close to the required curve that they can be cleaned up quickly with a file.

Be sure all backlash is out of the feedscrews when setting the zero points. Always cross-feed away from center (*A*-value) first, then feed down for the *B*-value. For an inside hole, values are reversed: cross-feed is *B*, and down-feed is *A*.

From a table of natural trigonometric functions it is easy to compute *A*- and *B*-values for any particular radius. For example, for a radius of 1 in., the tables can be read directly. *A* is equal the sine of any particular angle and *B* is 1–cosine. Examples are shown in Table 2.

Other radii can be obtained merely by multiplying the sine values by the decimal of the radius. For example, multiplying by 0.75 gives a ¾-in. radius, or by 0.25 a ¼-in. radius. The same decimals can be applied to the 1-in. value of 1–cosine for the *B* feed increments.

For convenience in setting the *A* increments, Nixon uses round numbers such as 0.60, 0.90, 0.120, and so on. However, the trig tables have few values that end in a round number. By taking the nearest value to one minute of angle, and using the corresponding cosine value for computing the *B* feed, values will be as close as the piece can be machined. However, to be sure that the tool does not gouge below the periphery of the circle, the 4th and 5th figures of the value 1–cosine should be dropped. For example, in the one-inch radius table, 1–cosine = 0.01638. *B* then is 0.016 in., and the down-feed is approximately 0.0004 in. short—or on the "safe" side.



Gravity-fed workholder on DoAll saw frees operator for other work while cut is being taken. Bells recall operator when cuts are complete. Center bell is for through cuts, side bell plus adjustable bar is for partial cuts

In the production of shaper work, Nixon has reduced lost time in every function of his organization. All shapers have fixed vises. These are carefully checked for any lost motion in both vertical- and cross-feeds, and for accuracy in fixed dimension from the tool-cutting edge to the bottom of the vise. In this way, operators do not need a scale for clamping the block. Shapers are operated in pairs, one with the vise jaws parallel to the stroke of the ram, the other with the jaws at right angles. One machines the length of a block, the other squares up the ends and edges. One man can easily run two or more machines.

Supplementing the shapers are a large power hacksaw, and a DoAll saw. The latter is both a stock-preparation machine and a production unit. To keep it in steady operation, Nixon has a special workholder-feed equipped with electric buttons to ring a bell when the cut is finished. The saw is never stopped, but the work, being gravity-fed by cable and weights, stops when the proper depth of cut is reached. The feed bar has been graduated on each side of the saw kerf so work can be set without a scale and angle blocks can be clamped on each side to guide the work. Duplicate pieces thus can be produced.

With these methods, a variety of unusual shaper work can be produced economically in small lots. By holding labor and overhead low, shops of this kind operate at a profit, yet save money for shops with higher overhead.

ENGINEERING AND PRODUCTION CONTROL SCHEDULE . . . . . Spinning

SACO-LOWELL SHOPS

Working Weeks Ahead of 1st Week in Shipping Period	OPERATION — Shipping Period →	1A Allotment Period Weeks 1-2-3-4	2A Allotment Period Weeks 5-6-7-8	3A Allotment Period Weeks 9-10-11-12	4A Allotment Period Weeks 13-14-15-16	5A Allotment Period Weeks 17-18-19-20	6A Allotment Period Weeks 21-22-23-24	7A Allotment Period Weeks 25-26-27-28
21	Receive contracts with Preliminary Specs. from Sales	32	36	40	44	48	52	4
19	Detail Shop Specifications	34	38	42	46	50	2	6
16	Complete Drafting	37	41	45	49	1	5	9
15	Complete Processing Prepare Parts List	38	42	46	50	2	6	10
14	Mark Items & Post to Allotment Sheets	39	43	47	51	3	7	11
13	Allot Parts and Request Orders	40	44	48	52	4	8	12
12	Issue Production Orders	41	45	49	1	5	9	13
8	Foundry Completion Date	45	49	1	5	9	13	17
4	Shop Completion Date	49	1	5	9	13	17	21
1	Erect for 1st Week	52	4	8	12	16	20	24
0	Ship for 1st Week	1	5	9	13	17		25

Master schedule sets up timetable for performing 11 major steps in production cycle. Work in all departments from Engineering to Shipping is planned for completion by week number shown in each Allotment Period

MASTER SCHEDULE GUIDES PRODUCTION PLANNING

Production-control system for complex textile machinery permits tight inventory control, yet gets orders out on time and is extremely flexible to meet changing business conditions

BY WENDELL B. LUND, Assistant to the Works Manager
SACO-LOWELL SHOPS, Biddeford, Maine

CENTRALIZED CONTROL of production and stores in two plants, one with 4800 employees and the other 600, has licked the problem of overdues and shortages at Saco-Lowell. Engineered and installed under the direction of Sven Vaule, then management consultant and now works manager of Saco-Lowell Shops, the system is tailormade to suit the complex and variable production requirements of the textile-machinery industry. With this system, control is maintained over more than 40,000 manufactured parts and 15,000 raw-material and purpurchased parts, plus many more special items that are not stocked. These are required for machines that often are composed of as many as 7000 parts and usually are engineered to customer specifications with no two orders alike. Yet, for more than two years, there have been practically no shortages on machines shipped from Saco-Lowell Shops and 95% of all contracts have been shipped on schedule.

This performance has been possible only because of tight control over every step in the production process from the time orders arrive until complete machines are shipped. The basis of this control is a master scheduling plan that has been drawn up for each of Saco-Lowell's eight major product lines. This plan, the *engineering and production control schedule*, lists all of the major functions that must be performed to translate customer requirements into complete machines. It also includes a master timetable that shows how many weeks in advance of the shipping date each major function must be completed if machines are to be shipped on time. From this timetable, schedules are set up.

For this purpose, the entire year is divided into 13 Allotment Periods, each of four weeks duration, and individual weeks are numbered from 1 to 52. Each Allotment Period consists of four numbered weeks during which shipments will be made. By starting with the number of the first shipping week of the Allotment Period and subtracting the number of weeks ahead of the shipping date that each function must be completed, according to the timetable, the complete Engineering and Production Control Schedule is determined.

For example, in the schedule illustrated, orders for all spinning frames must be received 21 weeks ahead of the first week of the shipping period. Therefore, as the shipping period for Allotment Period 7A is week numbers 25-26-27-28, all orders for the period must be assigned by the end of week 4. Again, referring to the timetable at the left of the schedule, Engineering must complete detail shop specifications 19 working weeks ahead of the first week in the shipping period. Therefore, this function must be completed by week 6. In a similar manner, the due date for each step in the total process can be computed.

This schedule is the master plan for production and is drawn up without relation to actual orders. Copies are distributed to the heads of all departments involved. Then, as orders come in and are assigned to a given Allotment Period, it is the responsibility of each department head to organize the work within his own section to turn out the load by the week number specified in the schedule. Weekly conferences are held so progress can be reported and problems discussed. Production Control also maintains a bar chart for each major product line, showing scheduled and actual performance. If one department falls behind, it immediately comes to light and steps can be taken to pick up time on subsequent operations and get back on schedule by the week that order must go to the shop. This full knowledge of scheduled and actual performance at all times probably is the most important single factor in Saco-Lowell's ability to ship complete machines on time. It not only permits immediate corrective action early enough to prevent disruption of schedules, but it also focuses attention on chronic trouble spots so action can be taken to eliminate causes of poor performance. This same principle also is applied with equal effectiveness in the handling of production orders in the shop.

Working by weeks, rather than months, throws emphasis on a steady stream of shipments and minimizes the tendencies toward an end-of-the-month rush. The target is set at a given number of units per week, and large placards bearing the current week number are displayed prominently in all departments.

The timetable of the Engineering and Production Control Schedule is determined by agreement between Sales, Purchasing, Engineering, Methods, and Manufacturing. Timetables vary depending upon the complexity of the product. While spinning frames have a 21-week cycle, twisters require 26 weeks, and so on for other machines in the Saco-Lowell line. For a given product, the timetable is flexible and is subject to revision if economic conditions warrant.

The problem created by great variability in customer orders is solved by assigning orders to Allotment Periods. This is done according to date received, modified according to the requirements of Sales and the capacity of the plant for each product line. For example, referring to the *engineering and*

CODES: (A) Assembly (M) Manufactured (MA) Machine Assembly (MC) Manufactured Component (P) Purchase (PC) Purchase Component (PA) Purchase Altered (PAC) Purchase Altered Component

Sheet 71 of 327

PERIOD 7A — SHOP COMPLETION WEEK

PART NUMBER	MANUFACTURING CODE	CONTRACT X-POINTING	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	ASSEMBLY COMPONENTS	TOTAL
				Lisbon 3 frs. 264-5-3/4 WP78	Dixie 16 frs. 252-4 18536	Friedli 5 frs. 256-5-3/4 WP98	Monday 30 frs. 248-4@ 17992	Gallatin 4 frs. 264-4@ 18534	Clark 12 frs. 264-5-3/4 18561	Lindy Dense 4 fr 260-5-4 28560	Dupont 2 frs. 268-4 18537	Clark 24 frs. 264-5-3/4 18562	J.P.Coats 18 frs. 264-5-3/4 18563										
304016-1A	MC																				8	8
47409-1	MC																				12	12
32-430	M			1008	4032	1680	7440	1024	3168			5760	3168									27280
28401	M			1008	4032	1680	7440	1024	3168			5760	3168									27280
304355-1	M								64				168									232
34419-1A	MC																					

Allotment-sheet masters show part numbers for parts manufactured in past six months. As *parts lists* for each contract in a given allotment period come from Engineering, production clerk enters quantities required per contract. After all requirements are entered on allotment sheet, cumulative total shows minimum requirements for period. Shop orders thus can be closely related to customer requirements when this is desirable

production control schedule, all spinning orders received up to the end of week 4 should be assigned to the 7A Allotment Period. This amount, however, must not exceed the number of units that can be built in the period. Therefore, cumulative totals are recorded and, when the Allotment Period quota is reached, any other contracts must go into the next Period. This record provides a reliable indication of shop loading anywhere from 5 to 8 months in advance of the load hitting the shop. If the backlog builds up, additional capacity can be planned permitting assignment of more units to each Allotment Period, or the opposite action if business falls off.

After assignment, contracts move to the engineering dept. As there is considerable variability in textile machinery, practically every customer order requires engineering attention. Although many components are common among several models, it is seldom that one order is a duplicate of another. Therefore, engineering time must be considered in setting shipping dates and is included in the engineering and production schedule. The same is true of drafting and process engineering. When these steps have been completed, each customer's order has been translated into a complete materials and parts list, which, in turn, has been further broken down into a *shop operation process sheet* for each item. Both the *parts list* and the *process sheets* then pass to the production control department where the *parts lists* are posted into *allotment sheets*.

Order Procedures Are Flexible

This step is preliminary to the actual ordering of parts from the shop. For this purpose a Kardex record is maintained on every item that is produced. Orders then are issued to the shop for a given part number without reference to the customer order for which the part is wanted. The order quantity is determined by the *allotment sheet*, modified by standard ordering.

The *allotment sheets* for a given line contain all part numbers required for all apparatus in that line arranged in numerical order. A clerk then goes through each part list for every contract, posting quantities required of each part. When the posting for a given Allotment Period is complete, postings are totaled to show exactly how many of each part must be shipped during the period. *Allotment sheets* then are forwarded to the Kardex record group.

By means of the *allotment sheet*, the differing specifications of many customer orders are reduced to a common denominator—the individual parts that must be produced by the shop. As actual requirements for any period are known, the system provides exceptional flexibility in establishing shop-order quantities. When the demand on shop facilities is high, order quantities can be held very close to requirements. Or, when capacity exceeds demand, some "float" can be added by ordering more than customer orders require on those models that are as nearly standard as anything the company builds. This is particularly helpful when a given Allotment Period is slack yet it seems that an upswing is starting, or for gradually increasing capacity when it appears that a peak is building. In this way, the production-control system can do much to iron out the peaks and valleys that occur when production is directly related to sales. It also permits extremely tight control over inventories and, since its complete installation in 1948, production has increased, while inventory has been halved.

Kardex part records show only *cumulative receipts*, *cumulative requirements*, and *open orders*. These provide all the information necessary, so no balances are computed. As the *allotment sheets* are checked, requirements for every item are entered, and cards on those items requiring shop orders are forwarded to two order clerks. Order quantities are figured according to a standard ordering plan, picked up from I.B.M. This takes into consideration annual requirements, setup costs, inventory carrying charges, and unit costs. In setting the standard ordering quantity, however, the plan is modified to suit Saco-Lowell conditions. For example, items that are not used during at least three Allotment Periods in the previous year are ordered only to requirements. Likewise, if the standard ordering quantity exceeds 6 months supply, the order must be reviewed by the production control supervisor. Several other criteria also

Production-control office contains file cards on more than 40,000 manufactured items. Here *allotment-sheet* totals are posted to cards and shop orders are prepared. Progress records are kept, deliveries are posted, shortages noted, and follow-up initiated. Office is nerve center of production organization

are applied, and quantities established on product lines subject to considerable fluctuation are reviewed periodically. A perpetual audit is maintained in the stores and production control areas. Four men count stock in all stores areas and check bin card records. Bin cards then are compared to Kardex ordering records by an office auditor and adjustments (if necessary) are made to cumulative balances.

Issuing Shop Orders

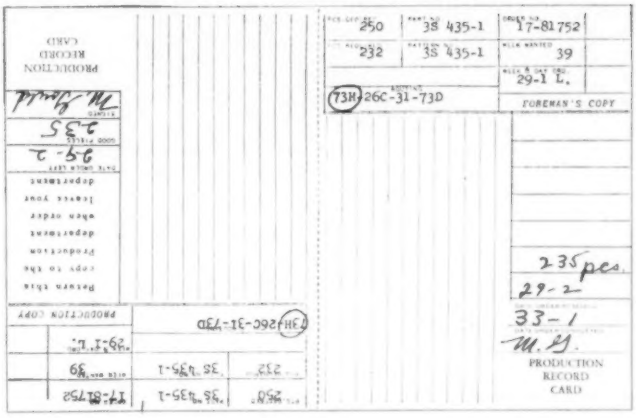
A complete set of shop paperwork is produced. This consists of a *production record card* for each department routed, *job tickets* for all operations, a *route tag*, *production material requisition*, and a *production order*.

A *production record card* (PRC) plus *job tickets*, *route tag*, *production order copy*, and a blueprint are forwarded to the first shop department in a cellophane-faced jacket. PRC's for the other departments involved in subsequent operations are forwarded direct to each department where they are filed under week wanted. This indicates to the foreman at least a month or more in advance what his work load will be and, if manpower adjustments are required, he can plan accordingly. The PRC also serves as his record of completed work, as half the card is retained in the department when the job is finished. The duplicate half is forwarded to the Production Control Office where it is filed. As PRC's come in, they indicate the progress of the order through the shop. When the card for the second routed department arrives, the first card is destroyed, so the PRC file shows where every job is located.

The *route tag* travels with the work, providing authorization for material moves, and eventually reaches Stores, where receipt of the completed parts is acknowledged. The *route tag* then is forwarded to the Kardex file for posting, after which it moves to the PRC file and is authority for removing the last PRC from file.

Job tickets and the *production order* are handled within each manufacturing department by the timekeeper, who checks start and stop times and pieces completed. *Job tickets*, then are forwarded to

SHOP ORDERS INCLUDE THESE KEY FORMS



Production record card is sent directly to each manufacturing department routed as soon as order is prepared. When order leaves department, half of card is returned to Production Office; other half is department record of completed work

DRAWING NO.	LOT QUAN.	LOT NO.	NO. OF LOTS	PCS. ORDERED	PART NO.	ORDER NO.
3S 435-1				250	3S 435-1	17-81752
PART NAME				PCS. REQUIRED	PATTERN NO.	WEEK WANT.
18T GEAR				232	3S 435-1	39
MATERIAL DESCRIPTION				MAT'L CODE	QUAN. OF MAT'L	UNIT
C.I.						WEEK & DAY TO BE COMPLETED 29-1 L.

DEFECTIVE P	DEFECTIVE M	DEPT. NO.	OPERATION 73H-26C-31-73D	RATE	OPER. NO.	M-W-UP STD.	STD. PER PIECE	TOTAL PCS.	TOTAL $	OPERATOR
			DELIVER TO DEPT. 26C							
		73H	(1) 3S 435-1							
		26C	CHUCK HUB SPOT DRILL RGH.	381	1	20.	3.40	248	6/15	101
			TURN O.D. BORE FIN. TURN	#4						
			O.D. FACE 1 SIDE REAM BURR	W&S						
			CHUCK O.D. FACE RIM FACE	381	2	8.	2127	248	6/18	2118
			HUB (2)CUTS) TURN HUB 1	#4						
			CHIP (CROSS SLIDE) BURR	W&S						
			INSPECT BY 592	31	3					
		31	CUT 18T 7.2P 2PCS. SGLE.	16	4	20.	.80	248	6/19	2118
			HOB 139.2 RPM .080 F	12A						
				BC						
			INSPECT TEETH	31	5	3.2	.48	248	6/19	2118
			POLISH & STAMP NO. TEETH	563	6	1.36	.65	248	6/19	2118
				024						
			CUT KEYWAY	071	7	7.1	.66	248	6/20	3001
			REAM TO CLEAN	36	8	22.	.51	248	6/20	3001
			INSPECT BY 592	31	9					F. Lynch

STANDARDS DEPARTMENT — DATE PROCESSED 2-26-51 — H. SLANEY — DELIVERED TO 73-D — FOR

PRODUCTION ORDER DO NOT FOLD

Production order contains essential job information including operations required on piece. Time keeper records time spent and pieces completed and holds card as record of status of job within department

Payroll and Cost Departments where they are processed on IBM equipment.

While this article stresses the production-control features of the Vaule system, it should be emphasized that Cost Control is an integral part of the over-all operation of the system. Through use of detailed process routings, job tickets, accurate timekeeping, and reliable piece counts, the system provides the Accounting Division with a ready means for determining shop labor costs. Cards can be processed rapidly on modern business machines to provide management with the operating figures it requires.

Production material requisitions are included in production order jackets if rough stores is the first routing on the process. Requisitions are prepared for replacement, rework, and assembly component requirements.

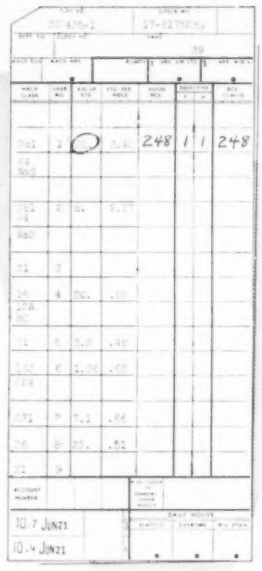
Process Sheets Aid Control

Issuance of shop orders is primarily a "ditto" procedure. Process sheets, which are sent to the Production Control Office the first time a part is specified, remain in the office thereafter. Repeat orders simply require the typing of specific order information which is attached to the master process sheet and run through duplicating machines to produce the required paper. It is extremely important to effective production control that accurate process sheets are available at the time part orders are issued. Otherwise, shop information is inadequate, resulting in confusion, delay, and possibly spoiled work.

Many raw-material orders with long lead time are issued on the basis of sales forecasts and past usage. These orders are checked against the actual production requirements as soon as the figures are available. Purchasing then is requested to make adjustments by cancelling or by going out for more, as the case may be.

For greater accuracy in scheduling orders in the shop, two *allotment sheets* actually are prepared, one for subassemblies and single parts (parts that will go into the final assembly as single items), the other for component parts

Job Cards Figured By Machine



Job tickets are punched to credit hours earned by operator. Cards are processed on IBM machines to prepare payroll and cost figures

that will go into subassemblies. The latter group is scheduled for completion earlier than the former. For example, in the foundry, component parts must be finished within three weeks, while single parts can be scheduled into the fourth week. In machining departments, component parts are scheduled two weeks ahead of subassembly dates.

In the Engineering and Production Control Schedule, the time allowed for erection of the product is relatively short considering the size and complexity of the machines. Customary practice in the manufacture of textile machinery is to erect only some basic units which, if they are right, insure the remainder of the machine going together properly. All other parts are sent directly to Stores and then, when all items are complete, to Packing.

Check to Avoid Shortages

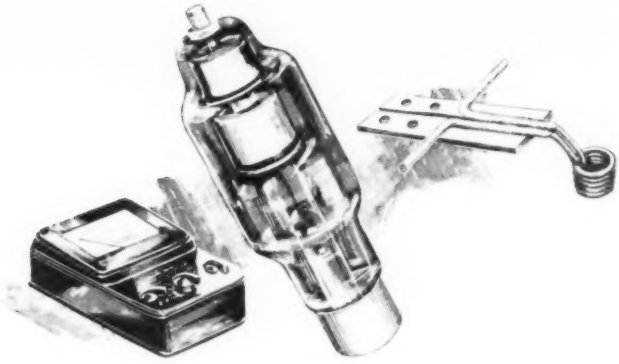
As Stores is so essential to the success of the entire system, a well-organized procedure is necessary. As parts come in, records of receipts and location are maintained. Stores then must gather all parts required for a given customer order for delivery to Packing and Erecting. For this purpose, Stores receives a complete *parts list* for each customer order. Copies of the parts list also are sent to the erecting floor and to shipping department. Three weeks before the completion date of assemblies, Stores picks up parts, accumulating them in one location. Stores then makes up a *shortage report*, listing all items missing, and forwards it to the Production Control Office. The PRC file is checked to determine the department responsible. The report then is given to an expediter, who follows the job until it is complete. In this way, potential shortages show up enough ahead of the shipping date so preventive action can be taken and schedules maintained.

Eases Load on Supervision

From an organization point of view, one of the major advantages of the present system is that a difficult job of production control can be accomplished by people who are not skilled in shop "know-how." Essential operating information is down on paper, relieving line supervision of routine details and freeing them for the more important task of over-all management within their departments.

Substantial reduction in inventories, better anticipation of material requirements, control during wide fluctuations in business, and flexibility in handling extensive subcontract work have resulted from the installation of this system.

Although results have been excellent since introduction of this system, there are numerous improvements that can be made. One is to develop a method for relating customer orders more closely to actual machine loading. Another is to mechanize posting operations in the Kardex file. However, although details of the system will be subject to continual improvement, the basic principle has proven itself well-suited to the highly variable and primarily job-lot production that characterizes the manufacture of textile machinery.



Induction Heater Maintenance Manual

BY L. R. MUELLER* ELECTRONICS SECTION • ALLIS-CHALMERS MFG. CO., MILWAUKEE, WISCONSIN

At first sight, an induction heater appears to be an extremely technical and complicated device, essentially electronic in nature. The radio-frequency power is, of course, generated by electronic means, but the circuits themselves are not as complex as they seem to be. All references in this Special Report are to the Allis-Chalmers 20-kw electronic induction heater. Heaters of this size constitute about 70% of all sizes used in industry. Other types of high-frequency generators are available whose circuits and protective devices vary. All, however, perform a basic function, and principles of maintenance and trouble-shooting can be applied to any induction heater, regardless of manufacture.

The major portion of an induction heater consists of circuits made up from ordinary, everyday components. Most of the internal parts are devoted to the 60-cycle circuits which bring power and control voltages to the r-f parts, rather than to specifically electronic parts. Consequently, servicing an induction heater is essentially the same as servicing any other industrial control device.

The primary difference is that an induction heater is basically a generator of r-f power. It is, therefore, necessary to be able to differentiate between normal and abnormal operation of the r-f circuits to get some idea as to the source of trouble. A detailed knowledge of the theory and operation of oscillatory circuits is not necessary for adequate servicing.

This Special Report presents the main troubles encountered, outlines the symptoms, and gives the procedure to be followed in applying the remedy.

*E. J. Ruthenck, Kenworth Mfg. Co., Milwaukee, Wis., formerly with Allis-Chalmers, co-authored the article.

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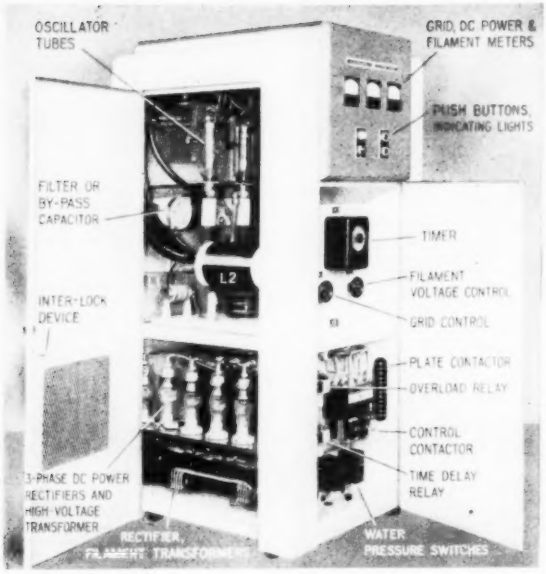
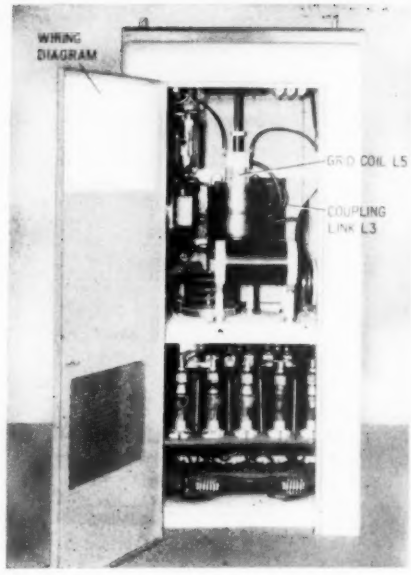


1 **All components of** a basic induction heater are assembled into a compact unit, but each is accessible for inspection and maintenance. Lethal voltages are used, so interlocks remove power when doors are opened



2 **DC power** and r-f section of a 20-kw heater, showing how the grid pickup coil (L5) is located within the tank inductance to pick up the driving power. Note wiring diagram inside door

HOW AN INDUCTION HEATER WORKS

VIRTUALLY every induction heater has protective devices, as shown in Fig. 1, which prevent destruction of the circuits through failure of a component. Consequently, almost any trouble will result in opening the overload relays or other safety devices. This, in most cases, removes the line voltage from the equipment. Hence, the maintenance electrician must have a clear picture of what is known as normal operation, so he can evaluate the circumstances immediately preceding breakdown.

To service an induction heater intelligently, it is necessary to know a few of the basic principles of operation. The oscillator tubes, Fig. 1, are high-vacuum electronic tubes which convert dc power to radio-frequency power. The r-f power is delivered to a resonant circuit, L4 and C9 in Fig. 5 and 6, sometimes called a tank circuit, which determines the basic operating frequency of the equipment and provides a means of transferring the power from the generator to the load. To sustain the tube in oscillation, a certain proportion of the tank circuit voltage is picked up by coil L5, Fig. 2, and delivered to the control grid of the oscillator tube. The magnitude and phase relation of this voltage is such as to permit sustained oscillation. Since the driving voltage of the unit is obtained from its own output circuit, the circuit is known as a self-excited oscillator. This is the basic principle upon which all vacuum-tube induction heaters operate.

A high-voltage rectifier and transformer combination, usually 3-phase in units of 10-kw size or larger, furnishes dc power for the oscillator tubes. The other circuits and components merely control the operation of the r-f circuits and the high-voltage dc rectifier.

This leads to a logical division of circuits for servicing (Fig. 3):

(1) 60-cycle circuits—This includes all relays, timers, pushbuttons and protective devices.

(2) High-voltage dc circuits—This includes the high-voltage 60-cycle transformer, rectifier tubes, and associated circuits for delivery of dc power to the oscillator tubes.

(3) Radio-frequency circuits—This includes the oscillator tubes and associated circuits responsible for the generation of r-f power for heating.

Basic Service Consideration

Many circuits carry voltages dangerous to human life. For example, in a 20-kw output induction heater, the dc voltage at the oscillator tubes is about 14,000 v. All heaters manufactured by reputable manufacturers have safety and interlock devices to prevent accidental contact with deadly voltages. Before servicing an induction heater, the repair man should acquaint himself with

the operation and location of these interlocks. The following points should be observed:

1 .. Have two men on the job. This is standard safety procedure.

2 .. Keep idlers and stragglers away from the equipment so power cannot be turned on without the serviceman's knowledge.

3 .. Use extreme caution when disabling interlock switches, as the voltages within the cubicle are lethal.

4 .. Never attempt to measure voltages in the high-voltage dc or r-f circuits with the unit in operation. These voltages require specialized equipment and are dangerous to measure with ordinary voltmeters.

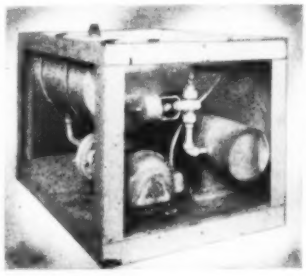
5 .. Do not attempt to locate the breakdown in a haphazard fashion. The outward signs of failure of a number of components are sufficiently similar that guesswork can lead to a considerable waste of time, plus possible further damage to the heater. Have a thorough knowledge of the schematic and wiring diagram and the function of each component.

There are two broad divisions of induction heater breakdowns: mechanical trouble and electrical trouble. Each division can also be broken down into internal and external troubles. The first step in servicing is to check the supply voltages and the cooling-medium flow. If these are normal, the trouble is in the heater itself. Consult the instruction book for proper operating conditions, and do not attempt to operate the heater unless these conditions are met.

If the trouble is not obvious, proceed as follows:

1 .. Determine whether any changes have been made in the method of operation. See if a different work coil has been installed, or the work itself has been changed. Difficulties may arise from improper coil design, rather than from trouble in the heater itself. If a change has been made, restore the heater to the original operating conditions and again determine whether it will perform satisfactorily; it it doesn't, then the trouble is within the equipment itself.

3 **Control panel assembly** is designed so each part is readily accessible, and contains all relays, circuit breakers and protective devices essential to the operation of the unit



4 **Self-contained** water-to-water heat exchanger prevents condensation and contamination. Use of distilled circulating water prevents formation of scale on power oscillator tube anodes

2 .. Check the line voltage. High line voltage can cause several troubles. It can cause the overload relay to open; it can cause arc-backs in rectifier tubes, or flash-arcs in the oscillator tubes; and can damage transformers and reactors. Low line voltage generally does not do any particular harm, but can cause reduced output. If the heater is operable, but does not produce as much energy as previously, low line voltage is usually the cause.

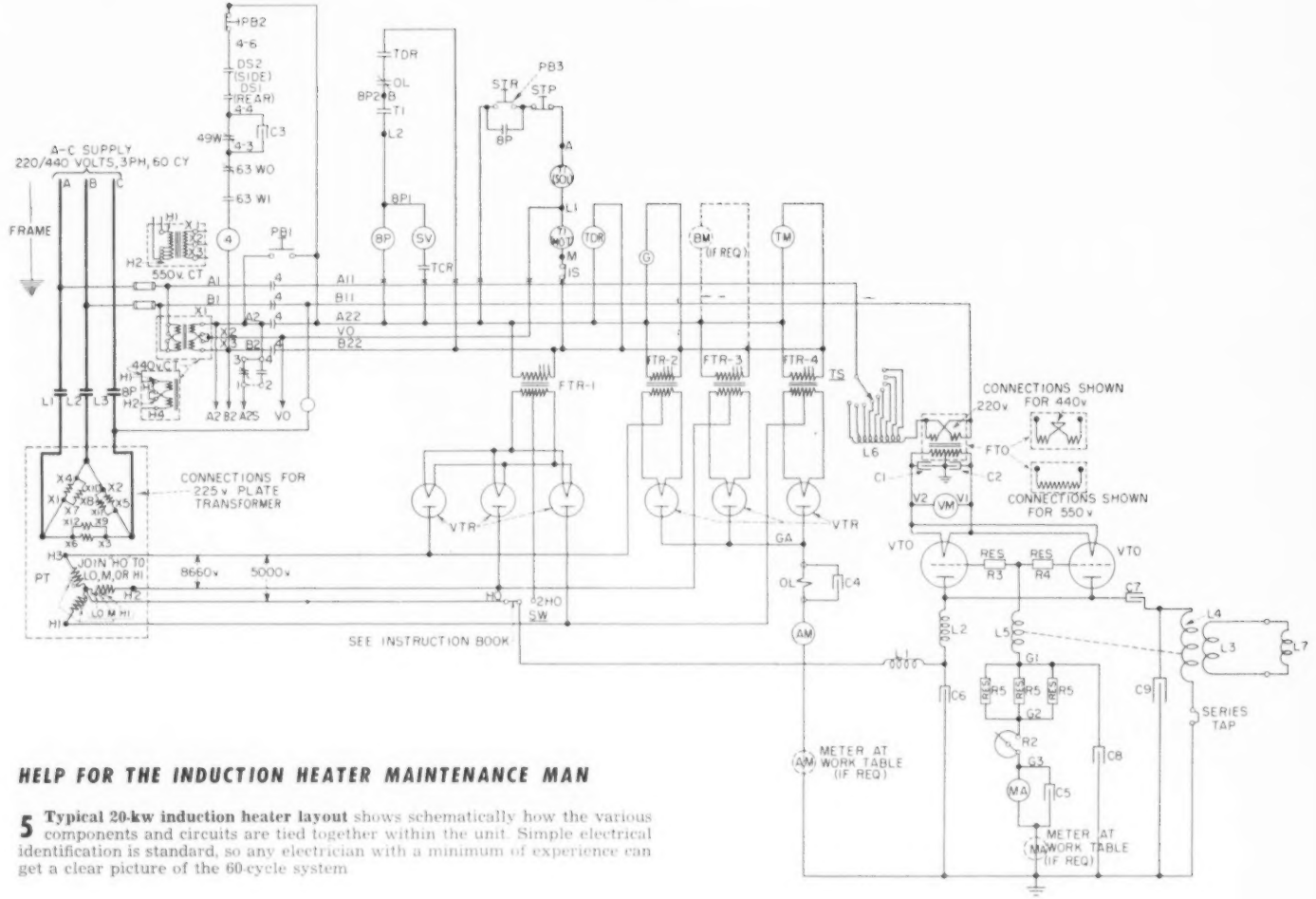
3 .. Note whether any of the fuses have blown in the hand disconnect. If all fuses are blown, it points to either a heavy overload or the breakdown of a high-voltage component. Arc-backs in rectifier tubes can blow one or more fuses, or open ac overload relays, although generally only one of the phases will be open.

4 .. Check if the dc overload relay opened; if it did, trouble has probably occurred in the r-f portions of the circuit. This overload relay coil is usually located in the grounded side of the dc power supply; consequently, any failure in the circuits supplied by the power supply will trip the overload relay. Failure of the rectifier tubes or the high-voltage transformers will not open the dc overload relay. Thus, if the ac overload relay is open and if line fuses have blown, but the dc overload relay has not operated, look for trouble in the ac system or the high-voltage transformer.

5 .. If the heater is water cooled, check the cooling medium. Most heaters have some form of protection against damage from water supply failure. This usually takes the form of switches to prevent turning on the filaments if trouble occurs in the cooling water supply. If the filaments are lit and the heater will not operate, because of tripping of the plate overload, it is a good sign that the trouble does not lie with the cooling water. If water pressure fails, or is above or below the specified limits, or if the temperature exceeds a certain amount, the heater will be shut down. A frequent cause of intermittent shutdown is the sudden reduction of water pressure caused by operation of fixtures elsewhere in the building.

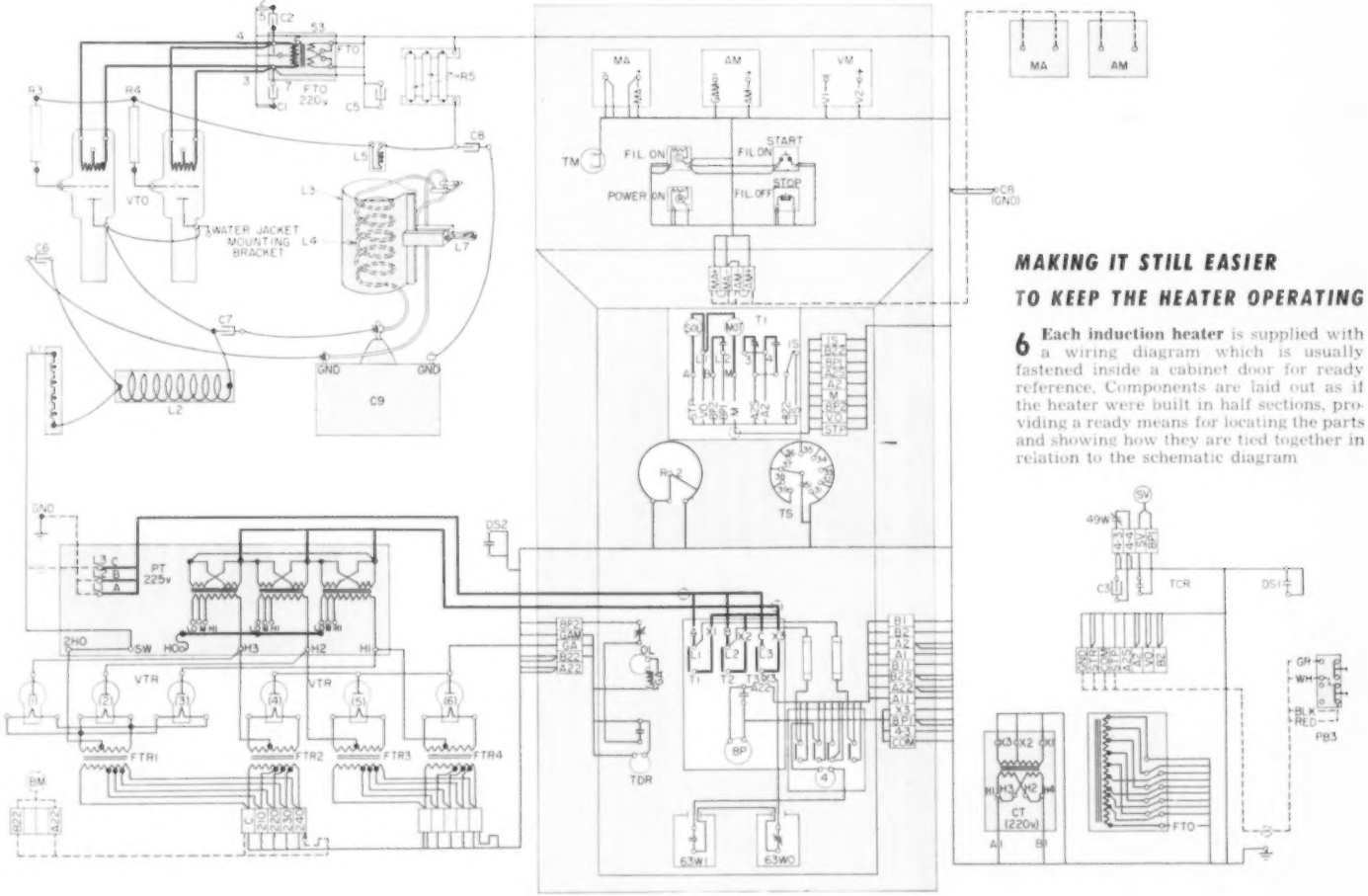
6 .. Check the fuses in the control circuit line. If they are open, some 60-cycle part has shorted out.

7 .. If there was any sound of arcing or muffled report, it is a



HELP FOR THE INDUCTION HEATER MAINTENANCE MAN

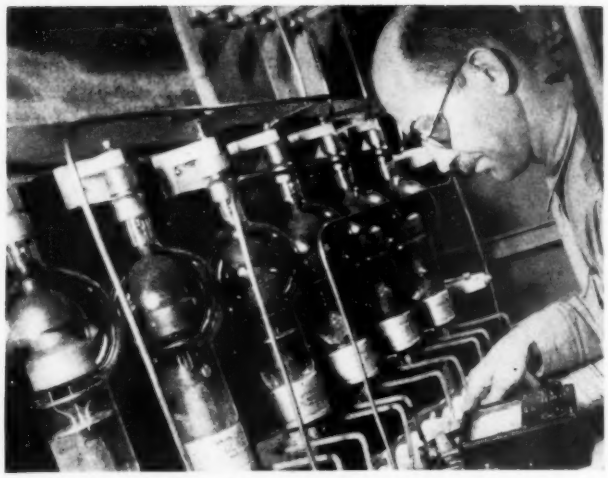
5 Typical 20-kw induction heater layout shows schematically how the various components and circuits are tied together within the unit. Simple electrical identification is standard, so any electrician with a minimum of experience can get a clear picture of the 60-cycle system



MAKING IT STILL EASIER TO KEEP THE HEATER OPERATING

6 **Each induction heater** is supplied with a wiring diagram which is usually fastened inside a cabinet door for ready reference. Components are laid out as if the heater were built in half sections, providing a ready means for locating the parts and showing how they are tied together in relation to the schematic diagram

7 **Tap switch** controls filament voltage and should be adjusted daily when line voltage is maintained within 5% variation. Correct voltage improves efficiency, performance and tube life



8 **Checking across terminal wires** with a standard voltohmeter. Operator wears safety glasses in case tube should shatter accidentally. This test must never be made with power on the rectifier tubes

good sign that the breakdown of a high-voltage part has occurred. If no particular sounds were observed, check the circuit step by step. Try to operate the heater as an initial step. If possible, use a coil with known plate and grid current values. If the heater can be turned on and appears to operate normally, the trouble was probably a sporadic arc-back in one or more of the rectifier tubes. If the tubes are cold, as, for example, on a winter morning, an occasional arc-back will occur. As these tubes approach the end of their useful life, they may also start to arc back.

8 . . If the heater again opens the overload relay, and perhaps blows one or more line fuses, examine the oscillator tubes. Defective oscillator tubes can produce various symptoms, many of which appear not to be related to the tube itself. If the tubes are old, replace with new ones, at least for test purposes. If this does not correct the trouble, an actual difficulty in the circuits can be expected.

9 . . Many of the failures produce similar outward symptoms, and if there is no visible arcing or other obvious sign of failure, check the circuits step by step.

60-CYCLE CIRCUIT

TROUBLE in 60-cycle circuits are traceable either to improper line voltage or to failure of one or more of the 60-cycle components, such as transformers or reactors.

The various components will operate satisfactorily over the normal voltage variation of commercial power lines. However, since performance is dependent on line voltage, the transformers can be adjusted to conform to existing plant voltage. The adjustment range is usually ±15% of rated nominal line voltage. Thus, most trouble caused by improper line voltage is manifested in the performance of one or more of the transformers.

A major source of trouble is high line voltage which can arise from a number of causes; the principal one being the shutdown of other equipment. Continued operation at abnormally high line voltages may cause failure of the plate and rectifier transformers. The following signs are observable:

(A) High oscillator filament voltage.

(B) High rectifier tube filament voltage.

(C) Increased power output.

(D) Failure of the plate transformer.

(E) Failure of one or more rectifier filament transformers.

The first sign will be higher plate and grid current meter readings, and increased power output. If the unit has a filament voltmeter the reading will be abnormally high. Transformer failure is obvious. The sound of arcing within the cubicle will be heard, and smoke is generally present. The line fuses and other ac protective devices, in most cases, open up. In general, high-voltage trouble will be evidenced by opening of line fuses or circuit breakers, rather than by operation of protective relays within the equipment itself.

Correction involves merely the readjustment for the proper line voltage, either by connecting the 60-cycle power to the proper taps on the transformers, or in some other way, depending upon the manufacture of the heater. The in-

9 **Replacing rectifier tubes** must be done carefully to avoid breaking. Sockets and electrical characteristics are standard, so tubes from any manufacturer can be used in the same heater

10 **Continuity check** between grid, plate and filaments determines if tube is defective. This test must never be made when power is on. Safest way to determine trouble is to replace with a known good tube

struction book will give detailed instructions for connecting to a given line voltage. Where the condition has existed long enough to cause failure of a transformer, this must be replaced.

When line voltage is low, little outward sign is evident other than in the low reading of the oscillator tube filament voltage, and a somewhat lower reading of the grid and plate meter. The power output of the transformer will decrease, resulting in a decreased amount of power for a given time cycle. This will show up as a lower temperature in the work. Little damage is done by undervoltage — rather it results in unsatisfactory performance because of reduced power.

Correction requires changing transformer taps to adjust for the actual line voltage. Normally, a variation ±5% can be tolerated without any change of taps on heater transformer.

Filament Reactor

Most heaters have a reactor in the oscillator tube filament circuit to limit the inrush of current to the tube filament when the unit is first turned on. Some have constant voltage transformers with an impedance sufficient to limit the inrush current. The reactor is an ordinary coil with an iron core which has an adjustable air gap to provide an adjustable impedance. Occasionally, the iron core becomes loose, permits the pole piece to drop down, and changes the reactance of the unit, and therefore the voltage delivered to the oscillator tubes. A distinct growling will be heard as the core loosens up. This can usually be detected long before the magnetic field draws the pole piece down to the pole itself, reducing the air gap to zero. Correction involves tightening the iron core. If the pole piece has slipped, it can be restored to its original position by measuring the voltage drop across the reactor and comparing it with the value shown on the circuit diagram.

Contactors

Filament - voltage and plate - power contactors ordinarily require no maintenance. The contacts are usually a silver-bearing alloy which need not be cleaned or dressed in ordinary service. Contactor operation can be improved by keeping the contactor free from contaminating matter. Occasionally, trouble may arise from loose parts on the contactor or burning out of the coil. This is readily observable by failure of the contactor to operate, and requires replacement of the defective unit.

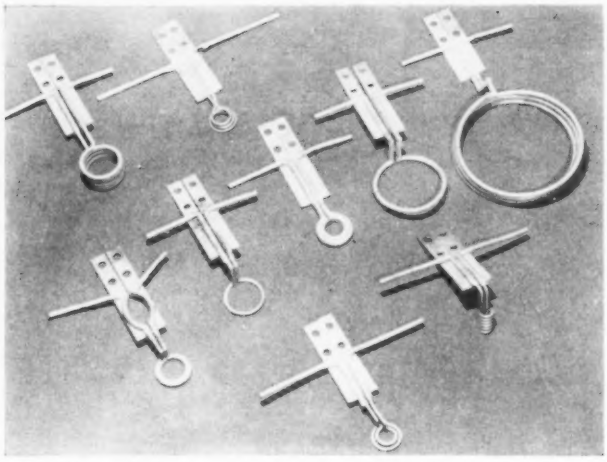
Protective Devices

Incorporated in the 60-cycle circuit are various devices to protect the equipment against misuse or failure of any of the circuit components. Interlock switches remove the high voltage in case any of the doors are opened. In addition, there may be fuses in the main power line and control circuit.

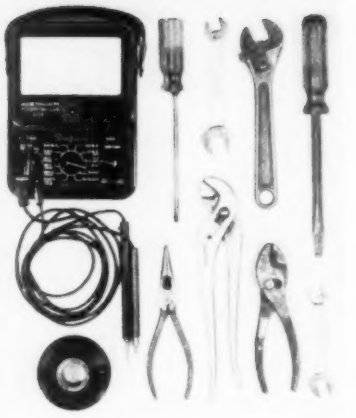
Operation of a protective device frequently gives a good indication of the source of other trouble. When this occurs, search the circuit for trouble before checking the protective device itself. In less than 1% of the cases is operation of the protective device caused by failure of the device. It is good practice, however, to check these occasionally as, for example, by decreasing water pressure or opening access doors.

Wiring

All 60-cycle wiring is conservatively rated and insulated for voltages far in excess of the normal operating voltage and temperature. Consequently, troubles traceable to a short circuit in the wiring are virtually non-existent. However, if



11 **Heater coils** are relatively simple to make. Chief maintenance requirement is to keep them clean, to see that the turns are not shorted, and to make sure there is free passage for water through them



12 **Simple tools,** carried by any electrician, plus a volt-ohmeter, are adequate for removing, replacing or adjusting most of the electrical components of standard induction heaters

a heater has been stored for a long time, rodents may have damaged the wiring. This is observable by the conventional signs of a short circuit in power wiring and is visible when the cubicle is opened. Replace damaged wires.

Timer Troubles

Most standard units are factory equipped with a synchronous-motor-driven timer or are controlled by a timer on the work-handling equipment. Faulty performance can be observed by failure to properly control the time cycle, or by failure to turn on the unit when the start button is depressed. Adjustment is a complicated process and it is better to replace the unit. Where the trouble results from a defective clutch coil or synchronous motor, replacement can be made readily, and the parts are carried in stock.

Time-Delay Relay

In addition to the cycle timer, a time-delay relay is provided in the oscillator tube filament circuit to prevent application of plate power before the tubes have warmed up. Failure of this timer will make it impossible to draw power from the unit. It can be detected by the absence of voltage in the plate-power control circuit. If the delay interval has become erratic it will show up in the ability to turn on the plate power sooner than usual after the filaments have been turned on. These units have an audible click when the time cycle has elapsed, and can be checked by listening for the sound of the contacts closing at the end of the delay interval. Correction is by installing a new unit.

Pushbuttons

The stop-start and filament-circuit buttons are conventional industrial pushbuttons. Trouble is rare, but, occasionally, because of contamination, the contacts fail to close, and the unit will not start. Where the heater is to be operated in an unusually dirty environment, use oil-tight pushbuttons. This applies also where a foot switch is used to apply plate power. If the heater cannot be turned on, it is most likely that the trouble lies elsewhere than in the pushbutton. If a check of the other circuit components reveals nothing abnormal, then inspect the pushbutton.

Pilot Light

All except the smallest heaters have pilot lights to indicate the operation of the various circuits. Trouble is invariably associated with burnt-out lamps. Failure will not affect operation of the unit or indicate any malfunction. On higher-powered units, pilot lights frequently indicate the operation of protective devices. Check these lamps occasionally, because a burnout would render the trouble light ineffectual.

Oscillator-Filament Voltage Adjustment

Most units have means for adjusting the oscillator tube filament voltage, either as a tap switch (Fig. 7) or a variable resistor in the filament circuit. When line voltage is fairly constant and the adjustment arm is not moved frequently, a small area of the resistance winding receives most of the wear. This may cause the winding to open or glaze over so the voltage cannot be adequately controlled. When a tap switch is used to adjust filament voltage, failure of a faulty contact causes erratic voltage variation. This generally requires a replacement of the switch itself.

Control-Circuit & Oscillator-Tube Filament Transformers

Most units have a small transformer to permit operation of the

control circuits at 110 v, regardless of the line voltage of the equipment. This generally has a 1-kva rating and is standard in every way. Troubles are so rare that they will not be discussed.

The oscillator-tube filament transformer is similar to the control transformer, except that the secondary voltage is reduced.

60-Cycle Bypass Capacitor

To protect 60-cycle components which are subjected to the r-f field, it is common to add bypass capacitors. These are invariably rated for voltages and currents higher than those to which they are subjected, so failure is rare. Failure does not always affect operation of the unit, but shows as increased sparking, and perhaps in unusual heating of a coil. Detection is rather difficult, so inspect them occasionally for evidence of burning or other trouble. If for some reason any of these should fail, the remedy is simply to replace them.

COOLING SYSTEM TROUBLES

THE MOST common form of cooling for heaters of 5 kw or more is by water. Failure of the cooling medium can destroy the oscillator tubes or the associated circuits. The protective devices are invariably set by the manufacturer, and should not be tampered with. They are designed to remove 60-cycle power from the unit. Therefore, operation of a cooling-medium protective device shows up in the 60-cycle circuit, although it means trouble in the cooling-medium circuit itself.

Improper Flow of Water

Protection of the oscillator tubes can be by pressure switches or a flow switch. In the first case, protection is by insuring that the inlet or outlet pressures do not exceed safe limits. Where the tube is protected by a flow switch, decrease of water volume will cause operation of the switch. Switches can be checked by disconnecting all power and allowing water to flow. Observe operation of the contacts to determine whether flow is adequate. If flow is below minimum, check the cooling circuit to determine the obstruction or source of difficulty. This may be foreign material in the line, or decrease of inlet water pressure below a safe value. To facilitate checking the flow, install a pressure gage on the inlet line as close to the heater as possible. To determine volume, run the exhaust water into a container of known size. If the heater has a sight drain, checking is much easier. Consult the instruction book for pressure ranges, volume, and pipe size.

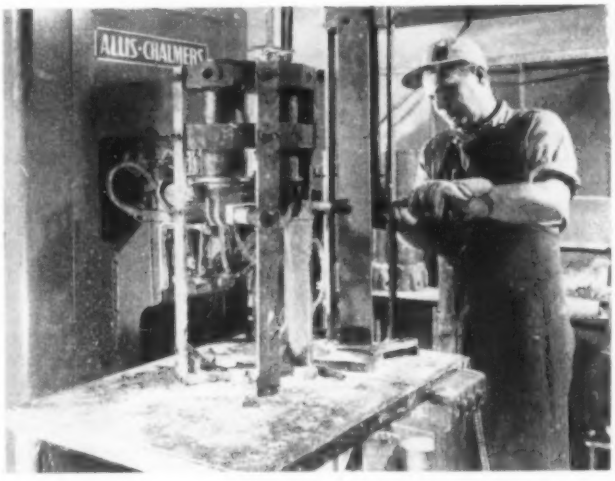
Improper Air Flow

For air-cooled units, a vane operating switch in the air stream opens the 60-cycle circuit if velocity is below the critical value. Blower is driven by constant-speed motor, so volume of air is constant and any obstruction is readily detected. Correction involves removing the obstruction.

Hard Water

If the mineral content of the water is high, deposition of minerals will occur as water temperature is increased. This deposit on the oscillator tube and in the r-f circuits causes an undesirable rise in the temperature of the part. Water temperature may drop, rather than rise, indicating that less heat is being transferred to it. Follow the manufacturers' specifications regarding water purity. If mineral deposit is greater than permissible for safe operation, remove the oscillator tube from its jacket at least once every 500 hr, or every three months, whichever comes first, and dip the anode in a 10% solution of hydrochloric acid. Rinse carefully.

Where a closed water-to-water heat exchanger system is installed, it is unnecessary to consider mineral deposits, as soft water is used. Minerals in the r-f cooling circuit cannot be seen without cutting the piping. However, if mineral is found on the tube anode, it can be assumed that it is present in the r-f circuits. If possible, remove elbow or other joints to check this. If no serious obstruction is found, it can be assumed that the plumbing is safe. Otherwise, the only recourse is to replace the plumbing. Do not continue to operate the heater without some means of correcting water purity.



13 **Brazing flux** frequently splashes and contaminates the working area, may cause r-f arcing in the work coil. The amount of flux and the trouble it causes determine the frequency of coil cleaning

14 **Relays, fuses,** and all protective devices are set by the manufacturer and should not be changed. Maintenance usually involves only cleaning. Replacement units should be preset before installation

Momentary Pressure Drop

If the unit drops off the line by operation of a water-pressure switch, it may be caused by a momentary drop in pressure resulting from a suddenly increased demand on the supply line, such as could be caused by a quench tank, sink or lavatory. The supply line variations should not exceed the operating limits of the heater.

High Water Temperature

The water temperature relay duplicates, in part, the operation of the pressure and flow switches, but is generally found as additional protection against too high a temperature of the incoming water. Operation of this switch produces virtually the same symptoms as the water flow and pressure switches, in that it cuts off the supply of 60-cycle current.

Its operation can be differentiated by attempting to turn the heater on immediately after it has dropped off the line. It will not be possible to do this, because cooling water must flow for a certain period to carry away the heat and permit the switch to close.

High Water Pressure

Since water-cooled r-f circuits frequently operate at high voltages, they must be isolated from ground by rubber hoses or ceramic coils. These cannot stand excessive pressure, so high-pressure switches cut off the unit if pressure exceeds the safe operating level.

The outward signs are the same as for low water pressure: The heater will drop in the middle of the heating cycle for no apparent reason and with no arcing. Operation can usually be restored by pressing the "start" button after pressure has dropped. If the heater drops off at random intervals, check the water pressure for rapid variations.

If pressure is maintained by a pump in the plant, check the pressure relief valve. Also investigate all other equipment on the line, which, by erratic operation, may cause sudden pressure rises.

Condensation

Many heaters have a switch to prevent flow of water in the r-f circuit until the temperature has reached a specified value. This prevents sweating under humid conditions, and prevents waste of water when the circuits are below the level which requires cooling. Sweating will liberate considerable water in the cubicle. Excessive sweating can cause arcing and voltage breakdown in the high-voltage components. If the cooling circuits sweat under full load, check the operation of this switch, because it may not be operating properly.

HIGH VOLTAGE DC CIRCUITS

THE high-voltage circuits involve primarily the rectifier tubes, Fig. 8, their associated filament transformers, and the high-voltage secondary winding of the plate-power transformer. Transformer troubles are usually confined to high-voltage failure of the winding. The physical characteristics of failure are the same as described above under high line voltage conditions. Note that deterioration of the insulation can occur with age, accumulation of dirt, or the presence of excessive moisture or oil. Certain of the filament transformers, while they are actually step-down transformers, may operate at a high dc voltage, so typical high-voltage failure can occur, although the ac voltage measured across the terminals may be only 5 v. Do not attempt to measure the secondary voltage of a rectifier-filament transformer with the plate power applied.

Rectifier Tubes—General

Trouble with a rectifier tube occurs when it fails to conduct current or fails to withstand peak inverse voltages. Failure can result from any of the following:

A. Open filament

B. Low filament voltage or cold ambient air

C. High filament voltage or hot ambient air

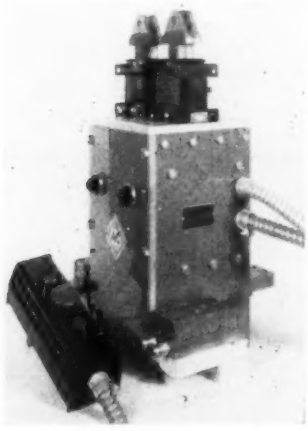
D. Age

Rectifier Tube Arc-Back

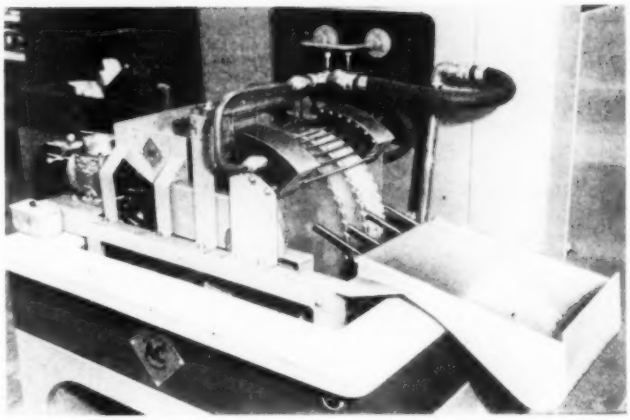
An arc-back can vary in both intensity and frequency. It may affect one tube only, and then only occasionally. If, however, it is severe, it may cause other rectifier tubes to arc back, opening all line fuses or other protective devices. It may occur occasionally, and not appear again, or it may appear every time an attempt is made to operate the heater. Tubes which have been in service for a considerable time show an increased tendency to arc back.

If the tubes are well within their rated life, arc-back troubles can be traced to some abnormality in the circuit operation. The trouble is generally caused by high line voltage. If line voltage is high, the filament voltage is above normal, resulting in overheating the tube which is a cause of arc-back. Arc-back results in shortened tube life because of damage to the filament and possible damage to other elements by the high current.

If the line voltage is within the operating limits and the age of the tube is not excessive, arc-backs can sometimes be traced to a high ambient temperature. Most rectifier tubes in industrial oscillators are cooled by radiation and convection. The instruction book will contain information on the maximum ambient air temperature at which it is safe to operate the heater. If operation is attempted at ambients above the specified level, arc-backs will occur, particularly as the tubes approach the limit of their life. Some units have small blowers for cooling the base of the tube. If the ambient temperature is within the specified limits, check the operation of this blower. Do not attempt to operate at an air temperature above the specified limit, unless the manufacturer has been consulted and steps taken to provide safe operation.



15 **Automatic r-f switch** converts single unit into two-station machine, so one part is loaded while other is heating. The only maintenance involved on the device is cleaning the switch contacts



16 **Auxiliary equipment**, such as this hopper-fed, rotary fixture for hardening both ends of valve-lifter rods, requires only conventional cleaning and mechanical maintenance to keep it in operation

Detection of Arc-Back In Rectifier Tubes

An arc-back in a rectifier tube will cause the ac overload relay to operate and may open one or more fuses in the supply line. An audible muffled report within the cubicle indicates trouble. The plate dc overload relay will not open, indicating that the trouble does not lie in the oscillator circuit. Occasionally, arc-back can be observed in the flare-up of a tube by opening the access door. This will open the interlock switch, so it will be necessary to block out the interlock to observe actual operation. Voltages in the rectifier compartment are lethal, so use extreme caution. The offending tube will generally have a much brighter blue glow than the others.

The only remedy is to replace the offending tube. A bad tube can sometimes cause others to arc back, so replace the suspected tube first to determine whether this completely clears up the trouble. If it does not, other tubes which do not appear normal should be replaced.

Rectifier Tube Fails to Conduct

Failure of a rectifier tube to conduct will be indicated by decreased heater output. This will show up as an increased heating cycle and a somewhat lower plate meter reading than is typical for the job being run. Failure to conduct can be caused by, (a) low line voltage; (b) excessive age of the tube; (c) low ambient air temperature; (d) open filaments. It is readily determined by observing the tube when the plate power is applied. Following the precautions outlined for arc-back observation, look for an entire absence of blue glow.

Low line voltage can result in low filament voltage, which means an inadequate operating temperature for the tube, resulting in a low mercury pressure. The same is true for operation at low ambient temperature. If the tube is old, failure to conduct can be caused by an open or deteriorated

filament. If ambient temperature is the cause of the difficulty, consult the manufacturer. This condition is rare, because the lower limit of safe operation is generally well below that in which it is comfortable for a person to work.

Replacement of Rectifier Tube

Because rectifier tubes contain a small amount of liquid mercury for production of mercury vapor, a special procedure must be followed when putting a new tube in service, Fig. 9. Consult the instruction book for proper technique. Before placing a tube in service, inspect it for physical damage during shipment. If tubes are removed and are to be replaced later, avoid inverting or jostling to prevent splashing mercury on the anode surface which can result in a tendency to arc back.

Insulator Failure

Occasionally, the insulating members which support the high-voltage dc circuits will fail, either because of an internal flaw, or from an accumulation of foreign material, resulting in a destructive dc arc. To guard against this, keep the insulators clean by wiping frequently with a rag moistened with nonflammable solvent. Make sure that power is turned off.

TROUBLES IN RADIO-FREQUENCY CIRCUITS

Bypass Capacitor

HIGH-VOLTAGE dc supplied by the rectifier tube is fed to the oscillator tube through chokes which are bypassed by a capacitor to form an r-f filter to keep r-f power out of the rectifier tubes. Trouble in this network is rare and is generally confined to the bypass capacitor. The most common fault is the shorting of this capacitor to ground, which short-circuits the dc system and opens all overload devices. Failure is observable by destruction of the part involved. The capacitor can be checked with an ohm-meter when the equipment is shut down. Any resistance value less than infinity indicates a faulty unit. Correction involves replacement of the defective parts.

Oscillator Tubes—General

Nearly all the trouble associated with r-f circuits can be laid to the oscillator tubes. To determine the specific nature of the defect in a tube requires considerable experience and test equipment not ordinarily found in maintenance departments. A few simple checks can, however, be made with an ordinary ohm-meter, Fig. 10. The filament circuit can be checked for continuity and should show a small resistance. Checking between filament and grid should show an open circuit, as should checking between filament and plate. Checking between grid and plate should show an open circuit. Always perform this check on a new tube to determine whether it has been damaged in shipment.

The first step when r-f trouble is suspected is to replace the oscillator tube. If this does not correct the trouble, examine the r-f components themselves. Oscillator tube troubles show up as, (a) r-f arcs, (b) abnormal grid and plate current meter readings.

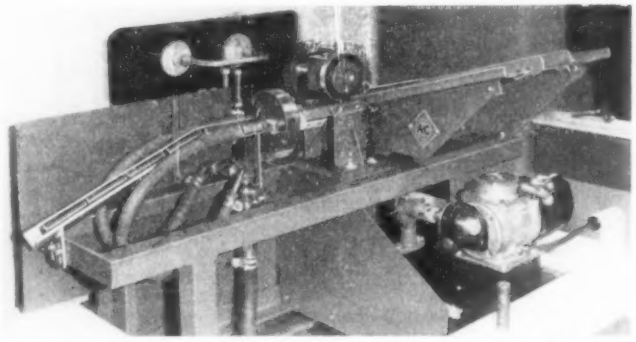
If replacement does not give satisfactory performance, one or more of the following difficulties can be expected: (a) shorted grid circuit; (b) open grid circuits; (c) defective tank capacitor; (d) excessive temperature of r-f circuits through restrictions in water flow; (e) insulation breakdown at any point in the r-f circuit; (f) failure of the coupling capacitor; (g) failure of the output circuit; (h) maladjustment of the circuit; (i) defective plate ammeter.

Shorted Grid Circuit

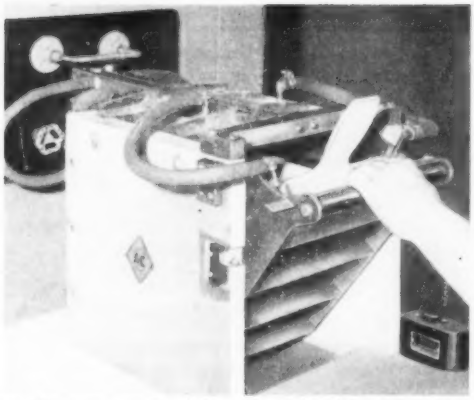
The most common source of trouble here will be in the grid capacitor. A shorted capacitor removes the grid resistor from the circuit, so the tube operates without bias voltage. The circuit will not oscillate, but the vacuum tube will draw high plate current with no grid current. All the power drawn by the tube is dissipated in the plate, and none is delivered to the work so, although the meter shows plate-current flow, there is no power output. This capacitor can be checked with an ordinary ohm-meter, or a Megger if one is available. Correction involves replacement of the defective parts.

Grid Meter Failure

Occasionally, no grid current will show on the grid meter because of a defective meter movement, although all other operations of the heater are normal. If performance is normal, check the meter for a defective movement. If the meter reading is extremely high, the shunt on the meter may have



17 **Automobile piston pins** and similar parts are readily handled on equipment of this type. Operator merely keeps feed hopper filled, and a power-driven friction wheel pushes the work through the coil



18 **Oven-type work coil** for awkwardly shaped part has hinged section to provide electrical continuity when closed. Door opens automatically at end of cycle

19 **Coil design** depends on shape of work, and coils can be made from various sizes of copper tubing. In bending, take care not to pinch and restrict flow

opened, directing all the current to the meter itself. Operation will be normal, other than the peculiar meter reading. Most grid-circuit meters are bypassed by a capacitor. If this shorts out, it will result in an abnormally low grid-meter reading. On the other hand, if the capacitor opens up, so it is no longer operative, the meter may burn out because of the r-f current which can find its way into it. If the meter fails, check the capacitor to see if it has contributed to meter damage or whether it is merely a defective meter. This trouble is rare, as these capacitors are operated much below their normal rating.

Open Grid Circuit

Trouble from an open grid circuit is more common than the troubles mentioned above. For example, the parasitic resistors or the pickup coil can open up, resulting in what is known as a floating grid. Occasionally, the bias resistors will open, giving rise to the same condition. The trouble will result in high plate-current flow, but no grid-current flow and no power output. It can be located with an ohm-meter by checking each component for continuity and for the specific resistance value shown on the wiring diagrams supplied with the equipment. Correction involves replacing the defective part. If the grid circuit is not open, examine the bypass capacitor, as it may be open circuited.

The only effective way to check an open capacitor is to measure the capacitance of the unit. This requires special equipment not ordinarily available in the maintenance department. If this type of failure is suspected, replace the capacitor.

Coupling Capacitor Failure

Oscillator tube output is delivered to a resonant circuit, called the tank circuit, through a coupling capacitor. This circuit consists of an inductor and a capacitor, so chosen that they are resonant at the frequency at which it is desired to operate the equipment. The coupling capacitor serves to isolate the high dc voltage from the tank coil and the output circuit. Shorting of this capacitor will open the plate overload relay, as this permits the high-voltage dc to short to ground directly through the tank coil. In general, this capacitor will show physical damage because of the magnitude of the current, and this can be readily observed. If this capacitor opens up, it isolates the resonant circuit from the tube, so no power output is realized, although grid and plate meters may show that oscillation is taking place. This will also trip the overload relay, since some other part of the circuit is permitting spurious oscillation to occur. Correction is to replace the part.

Tank Capacitor Dielectric Failure

The most likely source of trouble in the resonant circuit is the tank capacitor, since the tank coil consists merely of a coil of copper tubing amply spaced from surrounding parts. The commonest trouble with the tank capacitor is deterioration of the dielectric in the capacitor itself. This causes excessive heating and increased no-load plate current. With the power shut off immediately after a run with the heater, check excessive temperature in the tank capacitor by touching it. Remember that all power must be removed, because the voltages in this part of the circuit are deadly. If there is progressive deterioration of the dielectric, the capacitor will eventually be unable to withstand the operating voltage of the circuit and will arc over, opening the plate overload relay with a muffled report. Trouble is usually observed in the early stages by progressive rise in the plate-current reading. This can be observed when the heater is operating without load, by a high-load plate reading and by a high reading when the heater is actually working. Some units have a capacitor with a glass insulator to permit observation of discoloration, bub-

bling, and other indications that the oil is failing. If the trouble is noted soon enough, and the capacitor can be opened, it is possible to replace the oil. If this is done, clean the capacitor thoroughly with a suitable solvent, and examine the plates and insulating surfaces for arc damage. If arc damage has occurred, consult the manufacturer as to the proper corrective steps. In units that have a capacitor that cannot be removed because of its dielectric or construction, the obvious thing is to replace the capacitor.

Tank Capacitor Mechanical Failure

Because of mechanical imperfection or loosening through vibration in service, a part of the capacitor may occasionally short out. If this happens the unit will not oscillate properly, or may not oscillate at all because of the serious reduction in tank-circuit capacity. The plate meter reading can take almost any value, and grid current will be observed, although distinctly below normal operating value. There will be no heat in the work, although the unit appears to be oscillating. Correction is to replace the tank capacitor.

R-F Circuit Failure Through Dirt

Occasionally, r-f arcs may occur in the tank coil, usually between the tank coil and the surrounding coupling link. The circuit is designed with ample clearances, so any evidence of arcing in the tank coil itself indicates trouble somewhere in the circuit. This can be caused by dirt on the insulators, enabling an arc to jump from one component to other portions of the circuit. Wipe the insulating surfaces clean as often as necessary. Misalignment of the tank coil or link may occur through damage in shipment, but this is an infrequent source of trouble.

High Operating Temperature Causes R-F Arc

This type of trouble can occur because of a gassy tube. If replacing the oscillator tube does not correct the trouble, the difficulty lies in the tank coil itself. Arcing can occur when tank-coil temperature becomes excessive because of restricted water flow. This causes intermittent arcing in the tank circuit, and the excessive heat results in oxidation of the copper tubing to a reddish-brown color. Normally, only a small oxide film will form over a long period of time, so if a sudden increase is observed, overheating can be suspected. Do not attempt to determine the temperature of these coils with power applied, as the voltages are lethal.

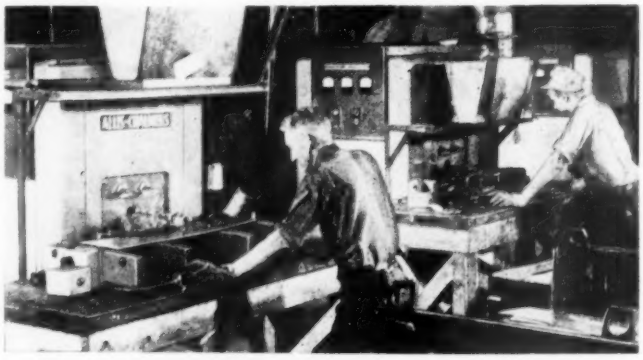
Trouble With Work Coil

Occasionally, the heater may appear to be operating normally, or almost normally, although heating in the work is low and time cycles are distinctly larger than when the equipment was new. If there is no evidence of abnormality in the circuits themselves, examine the output circuit, including the bus bars, for a possible short circuit. A frequent source of trouble is work coils which have been bent in removing and replacing on the heater, overlapping the gap between the bus bars and shorting the output. All the power is then dissipated in the output circuit itself, none going to the work. The meter may read near full load on the equipment, although the external heat obtainable is extremely small. Symptom is a boiling sound caused by excessive heating of the water in the coil and the bus bars. It is also observable by touching the bus bars when power is removed, because they normally run quite cool. Correction is to remove the short circuit.

An accumulation of brazing or soldering flux may also partially short out the coil. Check clearances and accumulation of dirt or flux on the bus bars before applying power. When connecting a work coil, remember that it is necessary to have a solid electrical bond as well as a good plumbing connection, as the same joint carries both water and current.

Improper Adjustment of Controls

When checking r-f circuit troubles, check the position of the various controls to see that they are in the proper operating position, because excessively high or low resistance in the grid circuit for the particular load may result in abnormal readings. After a job is set up and known to be operating satisfactorily, record grid and plate meter readings, as well as the setting of the grid resistor, so normal operation may be readily checked. Record the heating cycle, as it is a definite factor in the circuit adjustment. When any deviation of these values occurs, it can be readily checked, and time need not be spent in checking the actual circuit. If the work is placed too close to the coil, it can result in a high plate-current reading, which is purely a function of the placement of the work and is not related to oscillator trouble. In most multiturn coils it is possible for one or more turns to short out without vis-



20 **Induction annealing** of sheet metal prevents cracking during press operations. No definite heat pattern is required, so coils and fixtures can be quite simple

ible arcing or opening of overload relays, resulting in a distinctly different operating point for the unit.

Mechanical Maladjustment

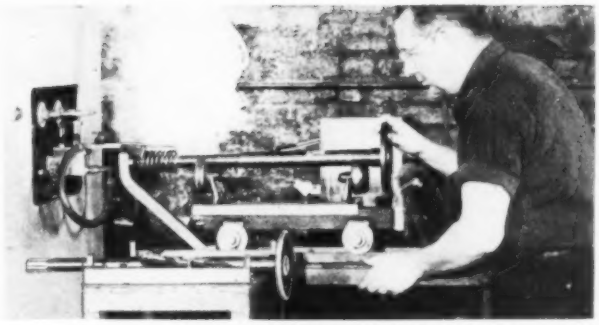
Internal maladjustment may occur through tampering or loosening of some mechanical joint, such as the clamps which position the inductor in the tank coil. This inductor picks up the driving voltage required by the tubes, and must be inserted a definite distance within the tank coil. If the clamp loosens and the coil drops into the tank coil, it is possible for the unit to be overdriven, with a considerable variation in readings from what is known as normal for the job. Consult the instruction book and use a standard test coil, usually supplied with the equipment, to check and reset the inductor.

Plate Ammeter Failure

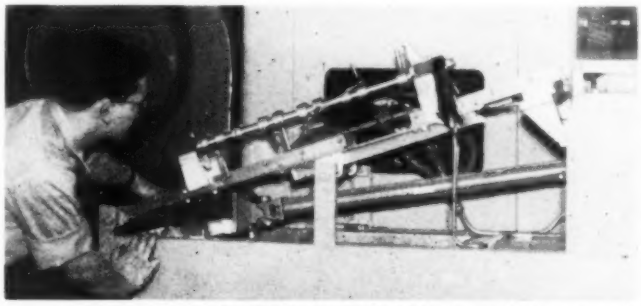
The plate ammeter is located in the ground return for the dc circuit and operates at a rather low voltage. Occasionally, it may be observed that the heater operates normally, although there is no plate-current reading. This can be a defective meter, or it can be caused by a short circuit in the dc return line carrying the current to ground ahead of the meter, instead of behind it. If the meter opens up so the circuit is broken, the unit will not oscillate, because plate current cannot flow. In this case there will be no plate- or grid-current meter reading, and the overload relay will not open, because no current is flowing. Correction involves replacement of the meter.

Improper Work-Coil Design

Faulty work-coil design can cause imperfect operation which is sometimes difficult to differentiate from circuit trouble. When setting up a new job it frequently happens that operation is not normal. This usually means improper work-coil design rather than circuit trouble. Most manufacturers supply a standard work coil and load, so if there is any question, connect this coil to the heater and check operation against instruction book values. Too tight a coupling in the work coil will cause immediate operation of the overload because of the high plate current. This can be corrected by loosening the coupling between work and coil, or in other words, increasing the coil diameter. If the coil is not properly shaped for the piece, it may short out to the piece itself. If this short is a solid connection, no visible arcing may occur, although it is possible to block the oscillator. Correction involves a properly shaped coil. Work-coil design has little or no relation to oscillator circuit trouble, as the circuit is designed with its own protective equipment. It is, however, quite critical with respect to obtaining maximum output from the heater. Actual troubles in the work coil are easy to observe and correct. The chief problem of work-coil design is not that of malfunction, but of proper design.



21 **Hand-operated dolly** positions axle shaft splines for low-production operation. Cleanliness of fixtures and checking of movable parts for wear are the only maintenance requirements



22 **Camshafts** are hardened in 8 areas in an automatic fixture so designed that one lobe at a time enters the coil and is heated and quenched. Production is at the rate of one shaft a minute

Work-Handling Equipment

The induction heater is usually operated with some form of auxiliary equipment, which may be manual, or automatic, depending upon the requirements of the job. This is interlocked with the heater, particularly in automatic units, so it is possible for it to shut the heater off, open the plate overload, or otherwse cause unusual performance. If a unit with automatic work-handling equipment operates abnormally, it may be necessary to check fixture and interlocking controls for the source of trouble.

In most cases the trouble will be ordinary mechanical difficulties or failure of some 60-cycle component of the fixture, and such failures can be handled by standard maintenance procedures. Difficulties with this equipment do not indicate circuit trouble in the heater.

MONTHLY MAINTENANCE CHECK PROCEDURE

THE FOLLOWING is a tabulation of a typical maintenance and check procedure which should be followed during the normal life of the equipment:

1 .. Clean all dust from interior with a light, dry air blast. Wipe parts of heater, tank capacitor, rectifier tube shelf, rectifier filament transformers, etc. with a rag dampened with trichlorethylene or other non-toxic solvent. Visually inspect unit for loose wires, misalignment, physical damage, etc. Clean bus bars of flux, grease, dirt and other foreign matter.

2 .. Check water for contamination.

A. When a recirculation system is used, be sure water has not been contaminated by dirt, fumes, rust or foreign matter.

B. Check recirculation system for proper operation, water level and cleanliness. Check all filter screens.

3 .. Check oscillator tubes every three months.

A. Remove tubes from jackets and examine anode. If anode shows signs of calcium deposits or discoloration, dip in 10% solution of hydrochloric acid. Install oscillators, using new gaskets, after tube has been washed in clear water.

4 .. Check line voltage.

Check line voltage and taps on main plate transformer.

5 .. Check water flow and switches.

A. Remove metal covers from water pressure inlet and outlet switches. Remove plastic caps protecting contacts.

B. Open water inlet valve and bleed water through slowly until switch closes—note pressure. Open valve to normal operating pressure. Close valve until water pressure allows switch to open. Repeat procedure. Switch must operate in this test, or it is faulty and must be replaced.

C. Restrict the water outlet so back pressure is increased to point where switch opens—see instruction book for pressure. Open water outlet, allowing switch contacts to close. Repeat procedure. Replace caps and metal covers. Switch must operate in this test, or it is faulty and must be replaced.

D. Check interior of unit for water leaks.

6 .. Check oscillator filament control.

A. Turn on filament power.

B. Rotate filament control tap switch through its positions, noting change in voltage, control of voltage and possible defects.

7 .. Check voltage on rectifier tubes.

A. To check voltage, the door interlock switch must be jumpered out, as filament power cannot be applied with door open. For safety, open the overload relay contacts so plate power cannot be applied while making this check.

B. See that all tubes light up.

C. After a few minutes of filament power, tubes will become warm. Check by feel after turning unit off.

8 .. Check door switches.

Check both door interlock switches for operation. Under normal operating conditions these switches must never be jumpered out or removed, as voltages inside the unit are dangerous.

9 .. Check time delay relay.

Check time required to close the contacts. 35 to 60 sec is normal. If unit is being operated on an exceptionally cold floor, a longer warm up period (1-5 min) will be necessary.

10 .. Check overload relay—no operating test necessary.

Operate contacts manually—keep clean.

11 .. Power test.

A. If unit is free of production setup, install test coil and test bar. Allow unit to warm up and then apply power.

B. Compare meter readings with test report of unit.

C. Check rectifier tubes for blue glow with power on.

D. Grid resistor control—no maintenance

Check that grid resistance can be increased or decreased with control knob.

E. Timer — no maintenance.

Keep case closed. Inspect for dust and excessive dirt. Check idling switch for performance. See maintenance of timer in instruction book.

F. Solenoid valve and temperature control relay.

Check with power on. There will be a definite click when solenoid and relay operate, which can be heard when standing near the unit.

12 .. Check total time meter.

No maintenance—note that meter operates.

13 .. Check indicating lamps.

Replace when burnt out.

14 .. Check blower motor.

A. Oil, clean and check brushes every 500 hr.

NOTE

As explained earlier, the information given here applies specifically to the 20-kw Allis-Chalmers induction heater, but since all heaters of this type operate on the same basic principles, the check list presented above may be used with only such minor variations as may be needed for the specific unit being serviced.

With ordinary care, such as would be taken in servicing any electrical equipment, repairs and maintenance operations can be undertaken by a competent plant electrician without specialized training on induction heaters. It is particularly important, however, to note that the service man must not take any chances. The voltages inside the cabinets are lethal, and power must be shut off before any repairs are made. It is advisable to hang a warning tag on the main switch, or otherwise guard against meddlers turning power on while maintenance is being performed.

Operators should be cautioned not to investigate troubles themselves unless fully competent to do so.

ROUND TABLE

Grumpy

"Whew!" sighed Ed, "Am I glad that this morning is out of the way!"

"S'matter, Ed, things getting in your hair again?"

"Not necessarily *things*, Al. It's Murphy that's got me worrying — the guy goes around grumbling all the time; it's a disease with him."

"Well, Ed, if it makes him any happier to grumble, let him go to it."

"It ain't that simple. What do you suppose he's doing to the other fellows? More than one have told me they're sick of the constant complaints coming from this dissatisfied Grumpy — I'm afraid that he'll have it spreading all around the shop. And I don't believe he's really upset about anything at all."

"Maybe the poor guy has family troubles!"

"Nope. I've met his wife and his family — three fine kids. It's just his nature, and that's no reason why the other boys should be interfered with. Why, only an hour ago he came to me and bellyached about having to lift one of the chucks. That's part of the job, to lift chucks."

"Don't you suppose that if you install a mechanical chuck lifter, Murphy will be able to get out more work with the energy he'd save?"

"He'd just find something else to bellyache about. I'll bet, Al, that if we'd equip Murphy with a bellyacheometer, we'd find that he puts out enough energy griping to lift ten chucks."

"I'm glad that he brought up the question, Ed; I've always been of the opinion that chucks should be handled mechanically. And his griping is toward improvement."

"I'll go along with you on that, but that doesn't remedy the situation. He gets everybody else griping, too. I think I'll ask Murphy if he wouldn't rather work somewhere where things were more to his liking."

"But he's a good man! Can't you and your prima donnas stand a little grumbling?"

"Sure, we can stand a little — but why should we stand a lot? If he's sour on the world, why should he make the others feel that way too?"

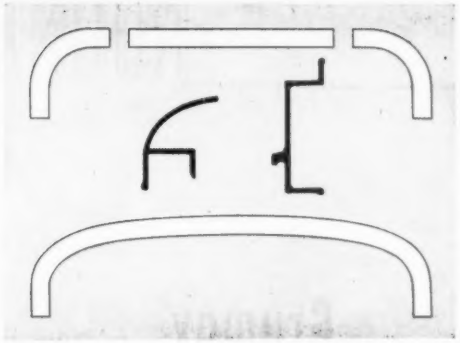
"Misery loves company, Ed . . ."

***CAN GRUMPINESS AND GRIPING** harm an organization—or is it natural, as they think in the Navy? Is it important, if the man is a good workman? Your ideas and opinions will interest others. Discussions of earlier topics appear on later pages.*

CONTOUR FORMING CUTS TRAILER COSTS

Nose and rub rails for highway trailers are made from aluminum extrusions and bent to shape . . . Cost is reduced by $14 per trailer, and $20,000 saved in die costs

BY H. E. LINSLEY, Associate Editor



Trailer nose rails were originally made in three pieces (top) and then welded, clamped or telescoped together because of the difficulty of bending the complicated aluminum extrusions (center). Contour forming (bottom) permits one-piece construction, with saving of time and material

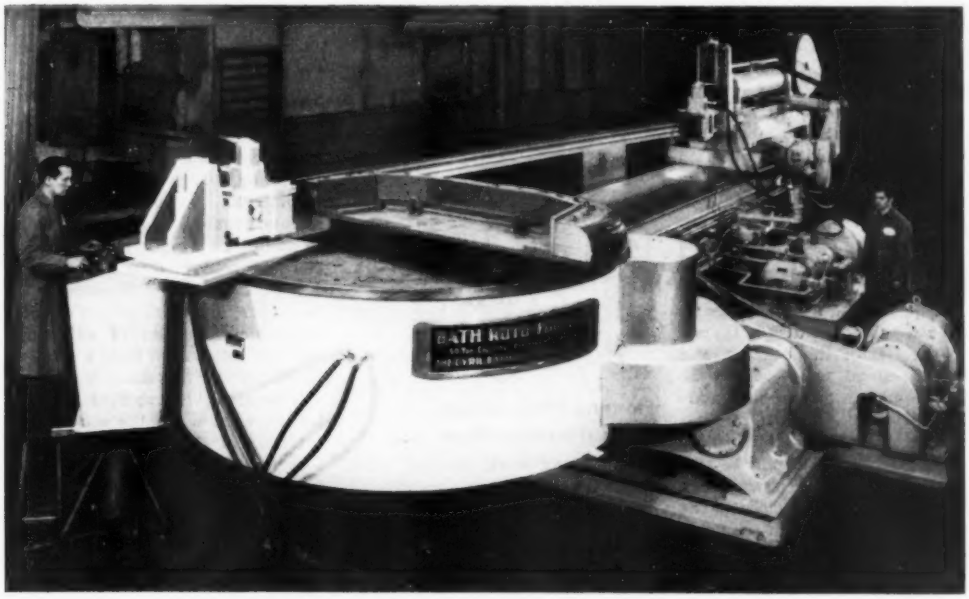
Rub rails, made of steel, have cross-sections that cannot be bent to conform to trailer lines by conventional methods, but are readily contoured on a Bath Roto-Former

Extruded aluminum upper nose member shows no trace of wrinkle or deformation of section. Forming die may be wood or masonite, and curves may have varying radii

Bottom nose rails of 61ST4 aluminum are produced at the rate of 15 per hr. All-aluminum trailer construction allows a dead weight saving of approximately 20%

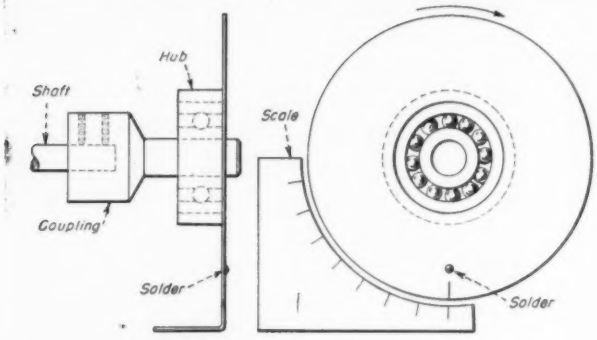
Z-section steel rings for trailer fifth wheels are also produced by contour forming. The relatively small size of these components indicates the versatility of the process and its adaptability to different materials

Nose sheets of corrugated aluminum. Contour forming in aluminum permits forming several components in one piece when there are two or more radii—a process either too costly or not practicable with steel construction



Extruded stock is wrapped around die by means of a rotating table in the center and clamping jaws on each end, under hydraulic control and with regulated pull or pressure

Practical Ideas



Bearing Selector Measures Freeness

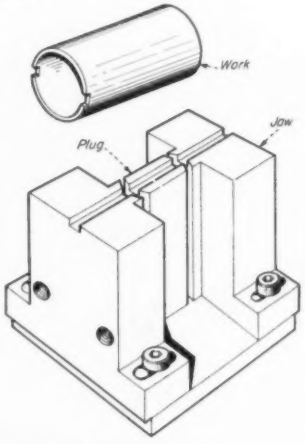
ONE OF THE TROUBLESOME problems in instrument work is selecting bearings that are extremely free. In many cases the instrument will fail completely if there is the slightest drag in the bearing. The illustrated device is an accurate bearing gage.

The device consists of a circular plate, marked with a scribed line as an index mark. This is fitted with a concentric, balanced hub that is a light press fit on the OD of the bearing being tested. A small piece of solder is sweated onto the disk at the point shown to throw the disk out of balance slightly.

The bearing is assembled onto the adapter, which is rotated at about 2 rpm by the shaft. This fit should also be a light press fit. Then the hub of the disk is slipped onto the OD of the bearing, and the sheet-metal scale—scribed so comparisons can be made—is added to the setup.

As the shaft and adapter rotate slowly, the bearing should be free enough to allow the index mark on the disk to remain close to the zero mark on the scale. If the bearing has more drag than can be allowed, the mark will rotate too far up the scale.

After checking a few bearings of the same size and type, a set of standards relating to the scale indication of each test can be worked out. *Henry J. Gifford, New York, N. Y.*

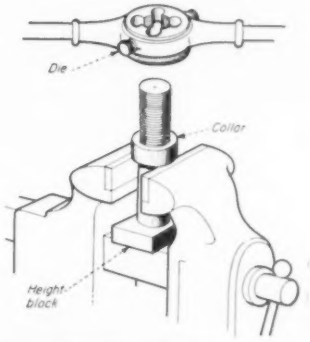


Floating-Plate Fixture Grips Flexible Work

TO KILL THE BURRS formed when the end of a piece of non-metallic tubing is slotted, a fixture with floating jaws was made. The whole fixture is mounted in a machine vise, operated by air or by hand, so the jaws can be closed up to grip the work tightly all around.

Work is slipped over the plug section of the fixture, which is 0.003 in. under the lower ID limit. Because both ID and OD of the work vary as much as 0.01 in. in size, the floating plate and jaws must have some flexibility when clamping. Therefore, they are fitted to distort the work slightly, if necessary.

After the work is clamped, the milling cutter works through the slots milled in the jaws and the plug section. *J. W. Newcomer, Kennett Square, Pa.*

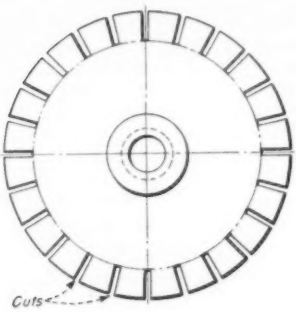


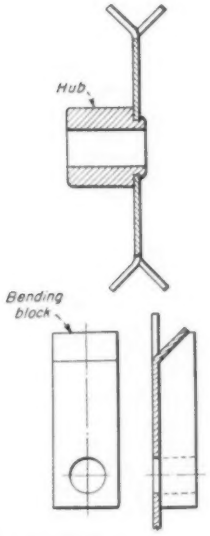
Threading-Die Stop Works on Bench Vise

WHEN WE HAD a job that called for threading a large lot of round rods to different lengths, we made this simple bench-vise setup. It may be useful for similar jobs.

The threads had to be cut to a 1½-in. length on some pieces, 1¼ on others, and 1-in. length on the remainder. Instead of adjusting the vise setup each time a change in length was necessary, we made this setup that simplified adjustments; even when the sizes were intermixed.

A height block was set on the base of the vise to raise the work, then each rod was located vertically between the jaws. A loose-fitting ½-, ¾-, or 1-in. collar was slipped over each rod, depending on the length of thread desired, to stop the hand die. *Fred Lettino, Astoria, N. Y.*





How To Make Rough Shop Pulleys

ODD SIZES of V-belt pulleys or sheaves can be made—for emergency use—by cutting and bending them from sheet metal.

The first requirement is a simple bending block, machined to half the angle of the pulley, plus allowance for springback. The round plate of sheet metal is slotted evenly all around, then the tabs are hammered back on the bending block to form the V of the pulley — alternate tabs being bent in opposite directions.

Any desired hub can be added after the pulley has been formed. I have used sheaves of this construction for quite a number of years; and while they have a better pulling power than the usual cast sheaves, they do not produce unusual wear on the belts. *Charles W. Schock, Minneapolis, Minn.*

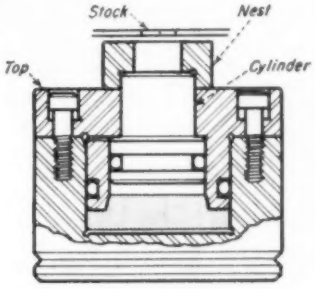
Compensating Staking Die Assembles Variable Parts

ONE OF THE PROBLEMS facing us in our new defense-tooling program was that of staking aluminum hubs into holes in aluminum sheet stock without distorting the parts.

Tolerances on the hub were wide, as delivered to the press, so the job was difficult because of variations in the length of the hub. To allow for this, a hydraulic compensating press die was made.

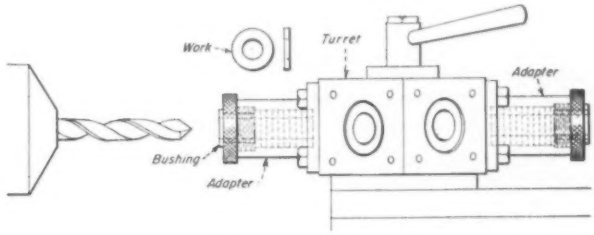
The die was a round block, bored to take a cylinder that fitted right under the punch and to take a projection of the die top. Both of these elements were fitted with O-rings to seal hydraulic oil into the well in the die. Capscrews assembled the die top to the die base, but were not tightened.

With the hub placed tenon side up in the nest, which was bolted to the die top over the cylinder,



the stock was located over the hub, and the ram was brought down. The press was a Dennison midget hydraulic press (1-ton), and a staking punch with a rubber pressure pad was attached to the ram.

As pressure was applied, the hub and cylinder were forced down. This pressure was transferred by the oil in the well to force the die top up, which clamped the stock securely between the die top and the rubber pressure pad. As more pressure was applied, the rubber pad compressed to allow the staking tip to enter the hole in the stock to perform the staking operation. *Inmon V. Hale, Piqua, O.*

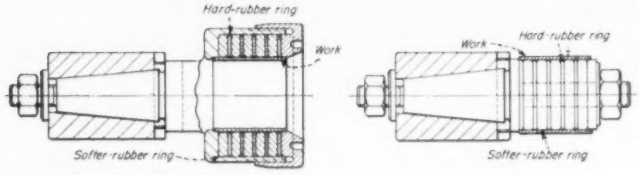


Two Turret Adapters Speed Boring Job

FOR A LARGE BATCH of steel disks —requiring boring out with a drill —we made two adapters to fit opposite turret holes. Each adapter takes 10 or a dozen disks, which are held in the blind hole of the adapter by a knurled-and-threaded cap that contains a drill bushing.

The caps are not quick-acting, but they hardly need be, because the operator takes off the cap of the adapter that is not in working position, unloads the completed disks, inserts a new set, and reassembles the cap while the other adapter is in working position.

If a reamed hole is required, the caps can be fitted with slip bushings. One point not illustrated is that a clearance hole for the drill or reamer should be cut in the bottom of each adapter—and this hole may be a through hole. *Allan Clarke, Rochdale, England.*



Rubber Chucks Set Up Small Parts

THESE TWO FIXTURES may give many shop men an idea of what can be done in the way of chucking small parts with rubber. Both are easy to make, easy to use, and are accurate. Their main advantage is that they bypass any chucking damage to fragile, lightweight products.

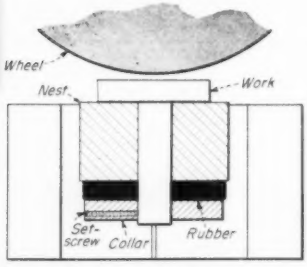
The chucks are normally held in the collet of a lathe, or may be held in the tapered bore of a lathe's spindle. When the taper-bored collar is assembled over the tang, a pin is slipped through a slot in the collar and a hole through the tang to lock them together.

Both chucks, one for external holding, and one for internal, are shown with collar-like workpieces in position. The work must receive finishing turning and boring cuts, so it must be held accurately.

Principles are the same in both cases; the only difference being that the left-hand holder is made with a cupped body that holds the rubber rings inside it, and the right-hand holder is made with the rubber rings built up over a mandrel.

Rings are alternately hard rubber and medium-hard rubber, with the softer rings somewhat thicker than the harder ones. The hard rings are guides for the work, and just clear it. When the tightening nut or collar is turned, the hard rings hold the work steady while the softer ones compress and expand toward the work to grip it uniformly and not too tightly.

An adaptation of these chucks can be easily made—for quicker action—by changing the screw caps and nuts into pressure plates that are operated by longitudinal pressure from the tailstock dead center. *D. G. Nolle, Wiesbaden, Germany.*

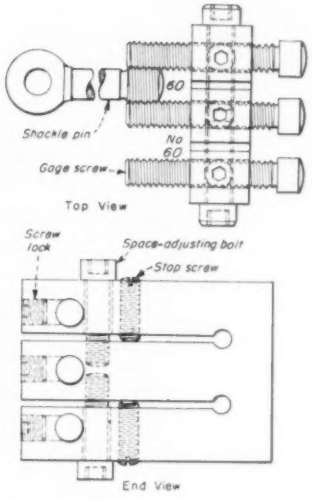


Nest Clamps Pinions For Accurate Grinding

I HAD TO MAKE some pinions on a lathe, but the length of the heads had to be held to 0.002 in. and the faces had to be exactly parallel. A parting tool in the lathe would not have met these conditions, nor would it have produced as good a finish as was required.

The method I devised was to drill a hole in a piece of steel to take the pinion with plenty of clearance, clamp this "nest" in a V-block, and place the assembly on a grinder table. Without the work in place, the nest was ground off flat and parallel to the table; then the work was inserted and clamped.

The clamping means was a rubber disk and a setscrew-fitted collar under it; both of which were assembled on the long hub of the pinion. The collar was fairly tight against the rubber disk, which made the rubber clamp on the hub. However, this clamp was flexible enough to allow the grinding wheel to seat the pinion face on the nest's top surface as it ground, thus insuring parallelism. *Albert L. Levitt, Bronx, N. Y.*



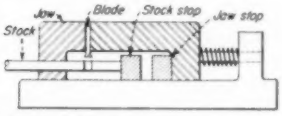
Screw Gage Checks Shackle Pins

HERE IS A cheap, easy way to gage shackle pins and similar threaded rods. The gage is built up on a small baseplate fitted with a block that has been slit with a sawblade.

Three holes are provided to take the gage screws. These are drilled and reamed—for accuracy—not tapped. The gaging screws are long, casehardened setscrews that slip into the reamed holes, and are held by smaller setscrews working through holes in the top of the slit block. These little setscrews hold the gaging screws firmly in place, and also allow adjusting the gaging screws for correct meshing with the sample parts.

The space between two of the gaging screws is the "go" part of the gage, while the other space is the "no-go" part. To adjust the spacing exactly, two bolts assemble through non-tapped holes in the section of the gage opposite each other. The hole through the center gage section is tapped so these bolts

can be tightened after the slit spaces are adjusted exactly by setscrews beside these bolts. The setscrews go through tapped holes in the outer gage sections, and bear against the faces of the inner section. With this setup, the gaging spaces can be accurately set, and will not change size easily. *N. Palmer, Paddington, Australia.*



Adjustable Saw Jig Clears Blade

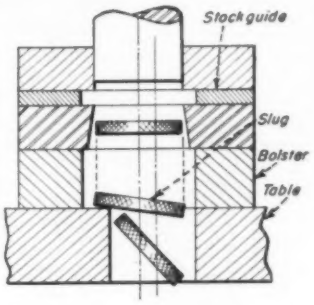
THIS JIG is equipped with a fixed jaw at the left end of the baseplate, and has a spring-loaded movable jaw at the right. The fixed jaw, of course, is built to clear the stock as it is fed into the jig. Two stops are provided; one to stop the stock and one to stop the jaw to prevent it from bearing tightly against the sawblade.

The jaws are shaped so the blade teeth clear them. When the blade is to be removed, the movable jaw can be pushed back to clear the teeth while the saw is lifted. With this arrangement, the jaws can be hardened; yet do not wear the blade excessively. *Federico Strasser, Santiago de Chile.*

Die Offset Drops Slug Through Small Hole

RECENTLY WE HAD to produce some punched parts where the slugs were actually too large to go through the central hole in the press table. Actually, the slugs were elongated rectangles, with the width smaller than the hole.

What we did was offset the die



set and bolster on the table so the slug would drop, one end would hit the edge of the hole, and the other end would tip into the hole. Going sideways, the slug would drop through easily.

The same trick can be done often when one dimension (not both) of the slug is too large for the hole. *Federico Strasser, Santiago de Chile.*

Indicating Snap Gage Has Sturdy Construction

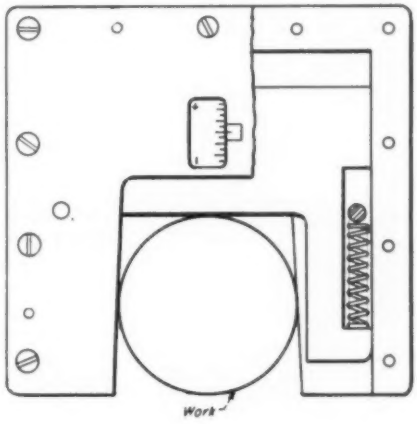
FOR THE TIMES when the machine operator needs a good indicating gage on his product to aid him in adjusting the setup, but when the inspection department will not loan him a dial-indicator gage, this tough design will allow close inspection of an OD on which there is a small tolerance.

The gage works on the principle of a jig-borer flat-strip gage. The gage body is made up of two U-shaped plates bolted on both sides of a frame. The opening is tapered to a small angle so the opening is a few thousands over the nominal OD at the outside, but is a few thousandths under at the root.

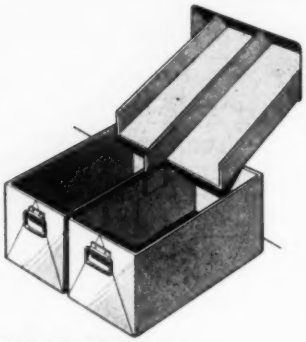
Between the tapered plates a third plate with straight sides operates. This has a U that clears the work. Its jaws are slotted out to take a spring and to clear a pin through the two main jaws, on which the spring works. A hole through the root of the top tapered-jaw plate exposes a scale scribed on the inside plate, and an index mark provides for checking dimensions.

The inner plate is spring loaded, so it will retract only as far as it is pushed by the work. The work, in turn, can only go in as far as the tapered jaws allow; therefore the scale will indicate the actual OD of the work indirectly.

Depending on the angle between the two tapered jaws, the gage can be made to indicate any convenient magnification. This one was set up for 100



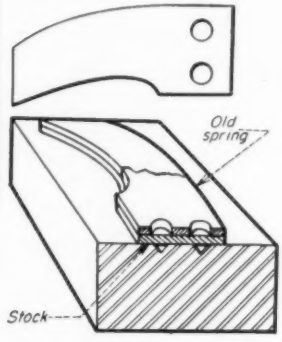
to 1; thus, a thousandth variation on the work diameter moved the scale plate a tenth of an inch. The scale was scribed to correspond to this ratio. *Tom Brown, Perivale, England.*



Split Feed Chutes Simplify Maintenance

ON DOUBLE-SETUP MACHINES, or any machine that turns out more than one part or has more than one set of tools, this is a good idea for controlling accuracy. Instead of letting all the work fall into a single tote pan, divide the pan and chutes leading to it.

This makes it possible to check the products from each tooling setup, so when one tool gets damaged or worn, it is easy to identify it. In most cases the chute can be divided, and two tote pans can be located under it. *Fred Lettino, Astoria, N. Y.*

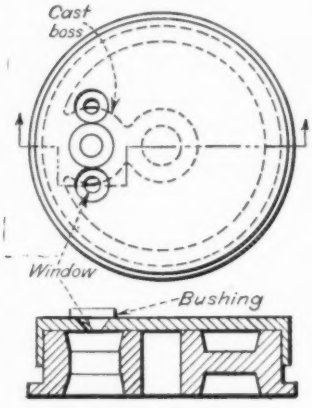


How to Drill Spring Steel

THIS IS ONE that I never thought could be done; but it was done by a repairman who was working on the Indianapolis Speedway timing mechanism.

The broken spring had the illustrated shape. The workman got a piece of spring from a broken clock. First, he clamped the old spring piece over a block of steel, took a drill of the proper size, and made drill-start marks through the old spring onto the surface of the steel block. Then he inserted the new spring piece, reclamped the old spring and steel block, made centerpunch marks in the new spring piece, and drilled. The tool he used was a regular HSS drill with an ordinary shape.

The job didn't even have a burr on it! Afterward, he cut out the outline shape of the part. *Chester S. Ricker, Detroit, Mich.*



Free-Vision Fixture Bypasses Layout Work

THE ILLUSTRATED CASTING was cast, then machined on a lathe in quantity. When we drilled the crankpin hole, however, we did it on a drill-press wit a pot fixture that slipped over the casting.

In order to locate the crankpin web under the fixture, so the drill bushing would be located correctly, we drilled two holes, one on each side of the bushing. These revealed the edges of the web to the operator, so he could simply equalize the edges under the fixture, then drill. The drilled hole would then be cut in the right spot.

The holes were conical-shaped, being cut with a countersink. The idea saved a lot of layout time. *C. L. Martin, Lennoxville, Que.*

$25 *In addition to regular payment*

for the best PRACTICAL IDEA

An extra payment of $25 will be made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

PAYMENT—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of the issue. The winner will also be announced in these pages as soon thereafter as practicable.

JUDGES— A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

REQUIREMENTS— Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worrry about your shortcomings as a draftsman, photographer or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

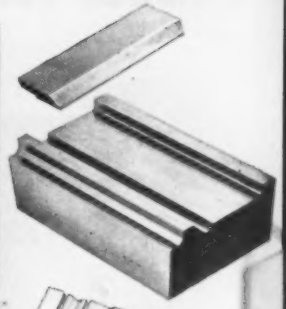
WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co., Inc., and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

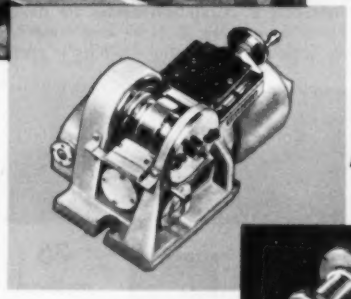
HOW TO ENTER – Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42d St., New York 18, N. Y.

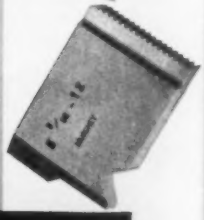
129th Winner:
(For May 28 issue)

M. YAMAGUCHI
Double-Operation Dies

Equip for Crushtrue Grinding to Speed Production and Cut Costs







You can produce the kind of work shown here faster and more economically with Sheffield Crushtrue Dressing Devices, and Crushtrue Dressing Rolls.

Dressing the grinding wheel by Crushtrue equipment (1) is very much faster than diamond dressing, (2) increases the cutting capacity of the wheel, (3) greatly reduces generated heat in grinding, (4) minimizes the tendency of the wheel to "load up" (5) reduces the actual grinding time as much as 75%.

Idler, Motorized and Self-truing Crushtrue Devices are available. Your selection will depend upon the work you do and the grinding equipment you have.

Crushtrue rolls for standard threads can be shipped immediately from a Sheffield "bank." Rolls for special forms for users engaged in long run production schedules can also be included in this stock on hand. Users send in rolls to be reground and immediately replacements from Sheffield's bank are forwarded at nominal cost. This relieves the user from the expense of ever having to buy new rolls.

Write for information on the Sheffield "Crushtrue Roll Bank" and specifications on these Crushtrue Devices.

5678

the Sheffield corporation

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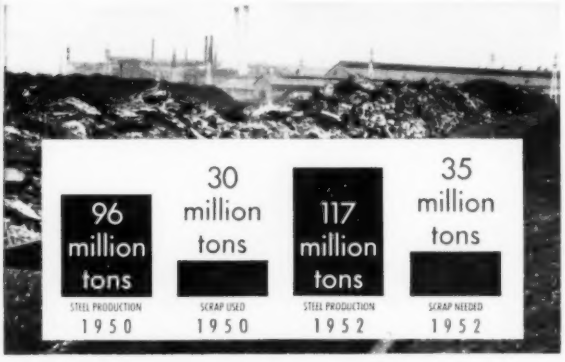
CONTRACT SERVICES • THREADING TOOLS

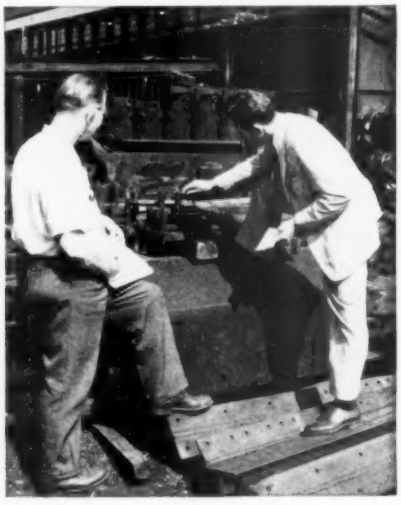
LET'S FACE THESE FACTS ABOUT SCRAP | THEN ACT!

This is no "scare" campaign for more iron and steel scrap. But it boils down to a few simple facts: **1.** Scrap inventories are dangerously low in steel mills all over the country, **2.** More steel scrap is needed today than ever before because steel-making capacity is greater.



Present low scrap piles in steel mills are due to one thing—the growth of steel production to more than 100 million tons a year, which requires several million more tons of scrap than have ever been available. By the end of 1952 steel production will hit 117 million tons a year. Besides scrap available from steel-making operations, the industry will require 5 million more tons of scrap than were needed in 1950.

Only top-management action can help insure an adequate supply of scrap. Many industrial leaders have named a permanent "salvage committee" for their plants and yards. This committee reports on all worn-out equipment and management decides what should be sold.



Remember, scrap resulting from current production isn't enough. Your committee should check every questionable piece of equipment and list all obsolete dies, jigs, equipment and machines. Then call your scrap dealer.

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Oil-Impregnated Sintered Bearings...I

This tentative standard MPA 14-51T has been prepared by the Metal Powder Association, 420 Lexington Ave., New York 17, N. Y. Additional copies are available from that group for 25 cents.

Scope

This standard lists and specifies the preferred dimensions and dimensional tolerances of sintered metal powder, oil-impregnated bearings of the bronze-base and iron-base types.

Nominal Bore

Sizes have been selected to match the shafting sizes most used in industry. They correspond to SAE sizes for inch-dimension ball bearings and to customary sizes for inch-dimension pillow blocks. Warehouse stock lists on the steels generally used for shafting purposes are also taken into consideration.

Wall Thickness

In most bearing sizes specified, two different wall thicknesses are given; a minimum wall thickness for light loads and a medium wall thickness for heavy loads. Outside diameter (housing bore) sizes are specified to accommodate standard size reamers.

Dimensional Tolerances

1. *Inside and Outside Diameter.*
   - Up to 1½ in. ID — 0.001 in.
   - 1½ to 2½ in. ID — 0.0015 in.
   - Over 2½ in. ID — 0.002 in.
2. *Length.*
   - Up to 1½ in. long ± 0.005 in.
   - 1½ to 3 in. long ± 0.0075 in.
   - Over 3 in. long ± 0.010 in.
3. *Concentricity*[2]
   - Up to 1½ in. ID 0.003 T.I.R.
   - Over 1½ in. ID 0.004 T.I.R.

[1]Such values are in accordance with ASTM Spec B 202, *Metal Powder Sintered Bearings (Oil Impregnated).*

[2]Concentricity (maximum Total Indicator Reading) is a measure of the uniformity of wall thickness and not out of roundness.

[3]See *Metal Powder Sintered Bearings (Oil Impregnated)* (ASTM B 202) and *Bearings, Metal Powder, Sintered (Oil Impregnated)* (U S Army Spec No. 57-239-2).

Permissible Loads

Permissible bearing loads for various operating conditions.[3]

Shaft velocity, fpm	*Permissible Loads, psi* Bronze base	Iron base
Slow and intermittent ...	4000	8000
25 ...	2000	3000
50 to 100, incl. ...	500	700
Over 100 to 150, incl. ...	325	400
Over 150 to 200, incl. ...	250	300
Over 200 ...	*	*

*For shaft velocities over 200 fpm, the permissible loads may be calculated as follows: $P = 50000/V$, where: P = safe load in pounds per square inch of projected area, and V = shaft velocity in fpm.

Running Clearances and Press Fits

Proper running clearance for metal powder sintered bearings depends to a great extent on the particular application. Running clearance may

Size Specifications and Designation

Inside Diameter in Inches Frac.	Dec.	*Outside Diameter in Inches* Frac.	Dec.	*Length in Inches*	*Part Designation*[4]
1/8	0.1275	5/16	0.190	1/4	MPA-100-16S
1/8	0.1275	1/4	0.2525	5/16	MPA-101-20S
1/8	0.1275	5/16	0.315	5/16	MPA-102-20S
5/32	0.158	1/4	0.2525	5/16	MPA-103-20S
3/16	0.189	1/4	0.2525	5/16	MPA-104-20S
3/16	0.189	5/16	0.315	3/8	MPA-105-24S
3/16	0.189	3/8	0.3775	3/8	MPA-106-24S
1/4	0.252	5/16	0.315	3/8	MPA-200-24S
1/4	0.252	3/8	0.3775	1/2	MPA-201-32S
1/4	0.252	7/16	0.440	1/2	MPA-202-32S
5/16	0.314	7/16	0.440	3/8	MPA-300-24S
5/16	0.314	7/16	0.440	1/2	MPA-300-32S
5/16	0.314	7/16	0.440	5/8	MPA-300-40S
5/16	0.314	1/2	0.503	1/2	MPA-301-32S
5/16	0.314	1/2	0.503	3/4	MPA-301-48S
3/8	0.378	1/2	0.503	3/8	MPA-302-24S
3/8	0.378	1/2	0.503	1/2	MPA-302-32S
3/8	0.378	1/2	0.503	5/8	MPA-302-40S
3/8	0.378	9/16	0.565	3/4	MPA-303-48S
7/16	0.440	9/16	0.565	5/8	MPA-400-40S
1/2	0.503	5/8	0.628	5/8	MPA-500-40S
1/2	0.503	5/8	0.628	3/4	MPA-500-48S
1/2	0.503	5/8	0.628	1	MPA-500-64S
1/2	0.503	11/16	0.690	5/8	MPA-501-40S
1/2	0.503	11/16	0.690	3/4	MPA-501-48S
1/2	0.503	11/16	0.690	1	MPA-501-64S
1/2	0.503	3/4	0.753	3/4	MPA-502-48S
1/2	0.503	3/4	0.753	7/8	MPA-502-56S
1/2	0.503	3/4	0.753	1	MPA-502-64S
9/16	0.565	11/16	0.690	3/4	MPA-503-48S
9/16	0.565	11/16	0.690	1	MPA-503-64S
9/16	0.565	3/4	0.753	3/4	MPA-504-48S
9/16	0.565	3/4	0.753	1	MPA-504-64S
5/8	0.628	3/4	0.753	3/4	MPA-600-48S
5/8	0.628	3/4	0.753	7/8	MPA-600-56S
5/8	0.628	3/4	0.753	1	MPA-600-64S

[4]First digit of first number series (or first two digits when bearing I.D. is more than 1 in.) indicates approximate inside diameter of bearings in 10ths. The second number series indicates length of bearing in 64ths. For example, MPA-301-48S is between 3/10 and 4/10 in. inside diameter and 48/64ths or 3/4 in. in length. "S" designates sleeve bearing. Designations as given indicate bearing is of the bronze base type; the letter "I" at the end would indicate iron base type. "A" indicates that the bearing length is greater than 1 in. but no more than 2 in.; "B" greater than 2 in. but no more than 3 in.; and "C" greater than 3 in. but no more than 4 in. For example, MPA-1601-32BSI is 16/10ths or 1.6 in. I.D., 32/64ths plus B (1/2 plus 2) or 2½ in. long, sleeve type, and iron base.

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Oil-Impregnated Sintered Bearings...II

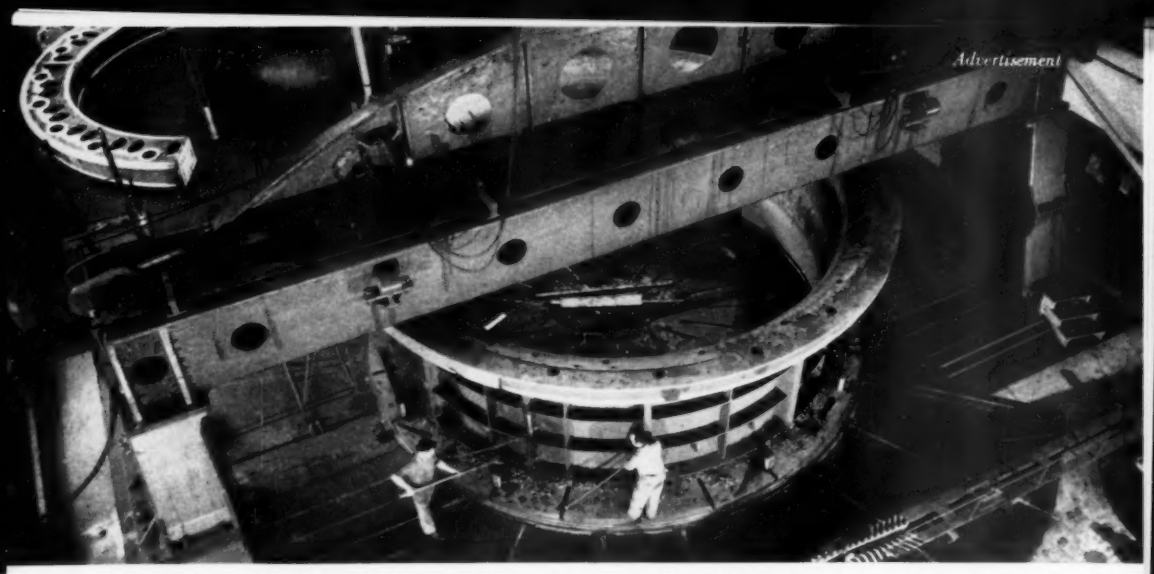
be obtained by using the bearing size specified together with polished and ground or cold drawn steel shafting.[1] It is advisable to specify shafting size below the nominal diameter tolerance in order to assure proper running clearance. Press fitting the bearing in a housing requires housings rigid enough to withstand the fit without appreciable distortion. For bearings having a wall thickness approximately ¼ of the bearing OD, press fits of 0.001 to 0.003 in. are recommended for up to ¾ in. outside bearing diameter; 0.0015 to 0.0035 in. for from ¾ to 1½ in. and 0.002 to 0.004 in. for over 1½ in. See footnote No. 1 on page 139.

Materials

Compositions of bearings specified conform to ASTM Designation B 202-45T and SAE classifications for sintered metal-powder bearings as follows: (a) Type I—Bronze Base, Class A or B, (b) Type II—Iron Base, Class A or B.

Size Specifications and Designation

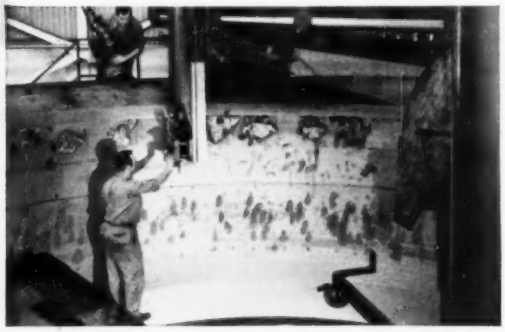
Inside Diameter in Inches		*Outside Diameter in Inches*		*Length in Inches*	*Part Designation*[4]
Frac.	*Dec.*	*Frac.*	*Dec.*		
5/8	0.628	13/16	0.815	3/4	MPA-601-48S
5/8	0.628	13/16	0.815	7/8	MPA-601-56S
5/8	0.628	13/16	0.815	1	MPA-601-64S
5/8	0.628	7/8	0.878	3/4	MPA-602-48S
5/8	0.628	7/8	0.878	1	MPA-602-64S
5/8	0.628	7/8	0.878	1-1/4	MPA-602-16AS
11/16	0.690	7/8	0.878	3/4	MPA-603-48S
11/16	0.690	7/8	0.878	1	MPA-613-64S
3/4	0.753	7/8	0.878	7/8	MPA-700-56S
3/4	0.753	7/8	0.878	1	MPA-700-64S
3/4	0.753	7/8	0.878	1-1/4	MPA-700-16AS
3/4	0.753	15/16	0.941	1	MPA-701-64S
3/4	0.753	15/16	0.941	1-1/4	MPA-701-16AS
3/4	0.753	15/16	0.941	1-1/2	MPA-701-32AS
3/4	0.753	1	1.003	1	MPA-702-64S
3/4	0.753	1	1.003	1-1/4	MPA-702-16AS
3/4	0.753	1	1.003	1-1/2	MPA-702-32AS
13/16	0.815	1-1/16	1.066	1	MPA-800-64S
13/16	0.815	1-1/16	1.066	1-1/4	MPA-800-16AS
7/8	0.878	1	1.003	1	MPA-801-64S
7/8	0.878	1	1.003	1-1/4	MPA-801-16AS
7/8	0.878	1	1.003	1-1/2	MPA-801-32AS
7/8	0.878	1-1/8	1.128	1	MPA-802-64S
7/8	0.878	1-1/8	1.128	1-1/4	MPA-802-16AS
7/8	0.878	1-1/8	1.128	1-1/2	MPA-802-32AS
15/16	0.940	1-3/16	1.191	1	MPA-901-64S
15/16	0.940	1-3/16	1.191	1-1/4	MPA-901-16AS
1	1.003	1-1/8	1.128	1	MPA-1000-64S
1	1.003	1-1/8	1.128	1-1/4	MPA-1000-16AS
1	1.003	1-1/8	1.128	1-1/2	MPA-1000-32AS
1	1.003	1-1/4	1.254	1	MPA-1001-64S
1	1.003	1-1/4	1.254	1-1/4	MPA-1001-16AS
1	1.003	1-1/4	1.254	1-1/2	MPA-1001-32AS
1	1.003	1-5/16	1.316	1	MPA-1002-64S
1	1.003	1-5/16	1.316	1-1/4	MPA-1002-16AS
1	1.004	1-3/8	1.379	1-1/4	MPA-1003-16AS
1	1.004	1-3/8	1.379	1-1/2	MPA-1003-32AS
1-1/8	1.128	1-5/16	1.316	1-1/4	MPA-1100-16AS
1-1/8	1.128	1-5/16	1.316	1-1/2	MPA-1100-32AS
1-1/8	1.128	1-3/8	1.379	1-1/4	MPA-1101-16AS
1-1/8	1.128	1-3/8	1.379	1-1/2	MPA-1101-32AS
1-3/16	1.191	1-7/16	1.441	1-1/4	MPA-1102-16AS
1-3/16	1.191	1-7/16	1.441	1-1/2	MPA-1102-32AS
1-1/4	1.253	1-1/2	1.504	1-1/4	MPA-1200-16AS
1-1/4	1.253	1-1/2	1.504	1-1/2	MPA-1200-32AS
1-1/4	1.253	1-1/2	1.504	1-3/4	MPA-1200-48AS
1-1/4	1.253	1-5/8	1.628	1-1/4	MPA-1201-16AS
1-1/4	1.253	1-5/8	1.628	1-1/2	MPA-1201-32AS
1-1/4	1.253	1-5/8	1.628	1-3/4	MPA-1201-48AS
1-5/16	1.315	1-9/16	1.566	1-1/4	MPA-1300-16AS
1-5/16	1.315	1-9/16	1.566	1-1/2	MPA-1300-32AS
1-3/8	1.379	1-5/8	1.628	1-1/2	MPA-1301-32AS
1-3/8	1.379	1-5/8	1.628	1-3/4	MPA-1301-48AS
1-3/8	1.379	1-3/4	1.754	1-1/2	MPA-1302-32AS
1-3/8	1.379	1-3/4	1.754	1-3/4	MPA-1302-48AS
1-7/16	1.440	1-5/8	1.628	1-1/2	MPA-1400-32AS
1-7/16	1.440	1-5/8	1.628	1-3/4	MPA-1400-48AS
1-1/2	1.503	1-3/4	1.754	1-1/2	MPA-1500-32AS
1-1/2	1.503	1-3/4	1.754	1-3/4	MPA-1500-48AS
1-1/2	1.503	1-3/4	1.754	2	MPA-1500-64AS
1-1/2	1.503	1-7/8	1.879	1-3/4	MPA-1501-48AS
1-1/2	1.503	1-7/8	1.879	2	MPA-1501-64AS
1-1/2	1.503	2	2.004	1-3/4	MPA-1502-48AS
1-1/2	1.503	2	2.004	2	MPA-1502-64AS
1-9/16	1.565	1-15/16	1.941	1-3/4	MPA-1503-48AS
1-9/16	1.565	1-15/16	1.941	2	MPA-1503-64AS
1-5/8	1.629	2	2.004	2	MPA-1600-64AS
1-5/8	1.629	2	2.004	2-1/2	MPA-1600-32BS
1-11/16	1.691	2-1/16	2.067	2	MPA-1601-64AS
1-11/16	1.691	2-1/16	2.067	2-1/2	MPA-1601-32BS
1-3/4	1.753	2	2.004	2-1/4	MPA-1700-16BS
1-3/4	1.753	2	2.004	2-1/2	MPA-1700-32BS
1-3/4	1.753	2-1/8	2.129	2-1/2	MPA-1701-32BS
1-3/4	1.753	2-1/8	2.129	3	MPA-1701-64BS
1-13/16	1.815	2-3/16	2.191	2-1/2	MPA-1800-32BS
1-13/16	1.815	2-3/16	2.191	3	MPA-1800-64BS
1-7/8	1.878	2-1/4	2.254	2-1/2	MPA-1801-32BS
1-7/8	1.878	2-1/4	2.254	3	MPA-1801-64BS
1-15/16	1.941	2-5/16	2.317	2-1/2	MPA-1900-32BS
1-15/16	1.941	2-5/16	2.317	3	MPA-1900-64BS
2	2.004	2-1/4	2.254	2-1/2	MPA-2000-32BS
2	2.004	2-1/4	2.254	3	MPA-2000-64BS
2	2.004	2-3/8	2.380	2-1/2	MPA-2001-32BS
2	2.004	2-3/8	2.380	3	MPA-2001-64BS
2-1/8	2.129	2-3/8	2.380	2-1/2	MPA-2100-32BS
2-1/8	2.129	2-3/8	2.380	3	MPA-2100-64BS
2-1/8	2.129	2-1/2	2.505	2-1/2	MPA-2101-32BS
2-1/8	2.129	2-1/2	2.505	3	MPA-2101-64BS
2-1/4	2.254	2-5/8	2.630	2-1/2	MPA-2200-32BS
2-1/4	2.254	2-5/8	2.630	3	MPA-2200-64BS
2-1/4	2.254	2-3/4	2.755	2-1/2	MPA-2201-32BS
2-1/4	2.254	2-3/4	2.755	3	MPA-2201-64BS
2-3/8	2.379	2-3/4	2.755	3	MPA-2300-64BS
2-1/2	2.504	3	3.005	3	MPA-2500-64BS
2-3/4	2.754	3-1/4	3.255	3-1/2	MPA-2700-32CS
3	3.004	3-1/2	3.506	4	MPA-3000-64CS



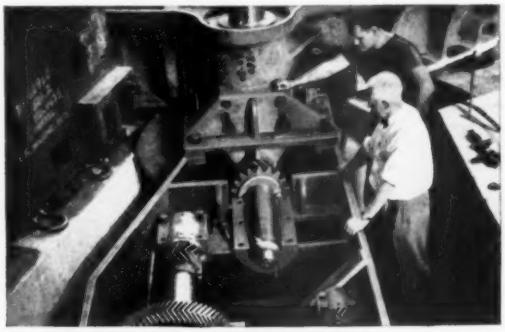
$400,000 VERTICAL BORING MILL, one of the world's largest, bores, turns and faces hydraulic turbine parts. Sunoco Way Lubricant, approved by 39 machine tool builders, was selected by the design engineers to prevent stick-slip with resultant scoring of ways and slides. Even under the weight of work as heavy as 75 tons, Sunoco Way Lubricant has never squeezed out.

TURBINE PARTS 62 FEET IN DIAMETER MACHINED BY HUGE VERTICAL BORING MILL

This mill was installed eight months ago by S. Morgan Smith, well-known hydraulic turbine manufacturer. Without alterations, it can take work up to 22 feet high with a maximum swing of 42 feet between housings. By removing the housings and adding a head to the face plate, it can be modified to handle parts 62 feet in diameter. Sunoco Way Lubricant, specified for the ways and rails by the design engineers, has been used exclusively. The mill accommodates work that weighs as much as 75 tons. No jump or stick-slip has ever marred a finish or impaired accuracy. The ways and rails remain like new. This is typical of the performance that has won the endorsement of 39 machine tool builders for Sunoco Way Lubricant. For an informative booklet and sample, write on your business letterhead to Sun Oil Company, Department AX-8, Phila. 3, Pa.



ELECTRONICALLY CONTROLLED CUTTING TOOLS machine a turbine discharge ring 9' high, 27' 8" dia., 21' 8" bore. Sunoco Way Lubricant keeps rails free of rust and corrosion. Starting up after week-end shutdowns, tables and other parts move freely on the ways and slides without jump or stick-slip.



THE SYNCHRONOUS GEAR DRIVE, controlling table speeds from .094 to 6.045 rpm., is pressure-fed with another Sun "Job Proved" product—Sunep. This extreme pressure lubricant is exceptionally stable, minimizes wear, gives long-time protection to very heavily loaded teeth in many types of gear boxes.

Punching Data . . . I

BY WILLIAM C. TUCKER,* BUFFALO FORGE CO.

Despite their wide use and generally accepted simplicity, punching machines are not always properly understood. A "punch," as the machine is frequently called, is designed to deliver highly concentrated mechanical pressure to the punching tool as directly as possible. Work size determines the tooling space required, such as the height and depth of throat. Standard throat depths range from 12 to 72 in.

Punching machines can be rated in two ways: in tons exerted and by size of hole punched through a given thickness of steel plate. The accompanying table permits the reader to ascertain the maximum thickness of plate for a different hole size if the rated capacity is known.

TOOLING

It is not advisable or safe to attempt to punch a hole with a diameter less than the material thickness, except by using special tools. If the hole is large, provide shear on the punch face, except that if the blank must not be distorted put the shearing angle on the die face. If material surrounding the hole must remain flat, put the shear angle on the punch face and leave the die surface flat.

A stripper is always necessary and should be set at least 1/16 in. below the height to which the punch face is raised.

DIE CLEARANCE

Clearance depends on material composition, hardness and thickness. For mild steel, the table below can be used to obtain the least amount of burring and long tool life. On soft metal the clearance can be less. It has been found that dies with a maximum clearance of 1/32 in. should be used for best results, when punching holes in ¼ in. thick and heavier materials. For lighter materials the clearance is 10% of stock thickness up to ⅛ in. and 1/64 in. up to ¼ in.

WORKING INSTRUCTIONS

It is not practical or possible to punch more than one piece of metal or thickness of metal at a time. Only torn, distorted holes can result from attempting to push the slug from the top sheet through the lower sheet.

Lubricate punches frequently, especially when punching hard materials. Use a small amount of heavy oil.

Always use a coupling nut that has a hole to fit snugly around the punch body. A loose punch will strike the material in a cocked position and then the die, ruining both tools. Do not depend upon hand tightening.

Abstracted from the book "Punching, Shearing and Bending" by Mr. Tucker.

DIE CLEARANCE FOR MILD STEEL

Punch Size	Material Thickness	Die Opening	Clearance
1/4	20 ga.	0.254	0.004
1/4	16 ga.	0.258	0.008
1/4	1/8 in.	17/64	0.0156
1/4	3/16 in.	0.273	0.023
1/4	1/4 in.	9/32	0.0312

COMPARATIVE PUNCHING CAPACITY TABLE

Thick. of Plate / Diam. of Punch / Diam. of Hole	3" × 3"	2 7/8" × 2 7/8"	2 3/4" × 2 3/4"	2 5/8" × 2 5/8"	2 1/2" × 2 1/2"	2 3/8" × 2 3/8"	2 1/4" × 2 1/4"	2 1/8" × 2 1/8"	2" × 2"	1 7/8" × 1 7/8"	1 3/4" × 1 3/4"	1 5/8" × 1 5/8"	1 1/2" × 1 1/2"	1 3/8" × 1 3/8"	1 1/4" × 1 1/4"	1 1/8" × 1 1/8"	1" × 1"	7/8" × 7/8"	3/4" × 3/4"	5/8" × 5/8"	1/2" × 1/2"
	THICKNESS OF PLATE																				
3"	3	2.75	2.52	2.29	2.08	1.88	1.68	1.50	1.33	1.17	1.02	.88	.75	.62	.521	.42	.33	.25	.187	.11	.083
2 7/8"	–	2 7/8	2.63	2.39	2.17	1.96	1.76	1.56	1.39	1.22	1.06	.91	.78	.65	.54	.44	.34	.26	.19	.135	.086
2 3/4"	–	—	2 3/4	2.5	2.27	2.05	1.84	1.64	1.45	1.28	1.11	.96	.80	.68	.56	.46	.36	.27	.20	.14	.09
2 5/8"	–	—	—	2 5/8	2.38	2.14	1.92	1.72	1.52	1.34	1.16	1.00	.85	.72	.59	.48	.38	.29	.21	.148	.095
2 1/2"	–	—	—	—	2 1/2	2.25	2.02	1.80	1.60	1.40	1.22	1.05	.90	.75	.625	.50	.40	.30	.22	.156	.10
2 3/8"	–	—	—	—	—	2 3/8	2.12	1.90	1.68	1.48	1.28	1.11	.94	.79	.65	.53	.42	.32	.23	.16	.105
2 1/4"	–	—	—	—	—	—	2 1/4	2.00	1.78	1.56	1.36	1.17	1.00	.84	.69	.56	.44	.34	.25	.17	.111
2 1/8"	–	—	—	—	—	—	—	2 1/8	1.88	1.65	1.45	1.24	1.05	.89	.73	.60	.47	.36	.26	.18	.117
2"	–	—	—	—	—	—	—	—	2	.175	1.53	1.31	1.13	.94	.781	.63	.50	.38	.281	.195	.125
1 7/8"	–	—	—	—	—	—	—	—	—	1 7/8	1.63	1.40	1.20	1.00	.83	.67	.53	.40	.30	.20	.133
1 3/4"	–	—	—	—	—	—	—	—	—	—	1 3/4	1.50	1.29	1.08	.892	.72	.571	.43	.321	.22	.143
1 5/8"												1 5/8	1.38	1.16	.96	.78	.61	.47	.34	.24	.153
1 1/2"												—	1 1/2	1.25	1.04	.84	.666	.51	.375	.26	.166
1 3/8"												—	—	1 3/8	1.13	.92	.73	.55	.40	.28	.182
1 1/4"												—	—	—	1 1/4	1.01	.80	.61	.45	.31	.20
1 1/8"												—	—	—	—	1 1/8	.88	.68	.50	.347	.222
1												—	—	—	—	—	1	.76	.56	.39	.25
7/8"												—	—	—	—	—	—	7/8	.64	.447	.286
3/4"												—	—	—	—	—	—	—	3/4	.52	.30
5/8"												—	—	—	—	—	—	—	—	5/8	.40
1/2"												—	—	—	—	—	—	—	—	—	1/2

EXAMPLE:

Given — A machine with capacity to punch 1 1/2-inch hole through 1 1/2-inch plate will punch a 3-inch hole through 3/4-inch plate or a 2-inch hole through 1.13-inch plate.

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TALKING SHOP

Simplification

ALFRED HERBERT, in a signed statement in our British contemporary, "The Machinist," decries the practice of ordering machine tools with a full range of accessories and elaborate equipment—most of it never to be used. Other equipment handles the jobs once done with such equipment, but the elaborate machine is purchased—out of habit, or so "full versatility" is provided in the shop. He mentions screw-cutting attachments on lathes, and universal millers where plain millers would do as well. He concludes "It is, of course, quite good fun to build elaborate machines, when there is lots of time to do so, but in today's conditions time is one thing we ought, above all others, to save."

To which we add only "Amen!"

Geometry the Key

IF YOU WANT to be a great creative engineer, check your geometry, says Dr. Ernst F. W. Alexanderson of GE. He firmly believes that ability to solve geometric problems is the first consideration in testing an embryo engineer—because it requires imagination. Algebra, on the other hand, can be solved by routine rule.

Moisture Drills

AUTO LACQUERS and enamels dull, or "chalk," not from exposure to the sun, but as a result of moisture, according to Ralph J. Wirshing of GM. It is not oxidation, but reduction—causing oxygen to withdraw from the film — that causes the trouble. Apparently, hydrogen peroxide is the culprit. It is formed from water and some oxygen from the finish and acts as a reducing agent when conditions are right.

Streamlined Tester

FAIRCHILD Engine & Airplane Corp. has developed, with Topflight Tool Co., Inc., a production hardness tester for small sheet-metal parts. It replaces five inspectors and certifies with a company stamp. Four machines are now in use at the small-parts plant. Basis is a specially adapted Barcol impressor with a range of 33 to 155 Bhn. The machine is set for material thickness and minimum spec hardness, then parts are hand-fed under the indentor point which reciprocates vertically at 40 times a minute. Pieces which pass are stamped automatically and registered on a counter. A dial in the base gives a visual indication, a flashing green light can be used if parts are not to be stamped, and the stamping can be done without test, if desired.

Lead

CABLE COMPANIES use about 11% of annual lead production, because no other material is as impervious to moisture and can be as readily applied to cable. Many efforts have been made to find cheaper alternate materials, thus far to little avail, according to R. C. Waldron of Okonite Company.

Synthetic Freight

NEW YORK AIR BRAKE COMPANY, Watertown, N. Y., has a 200-car freight train that never leaves the plant. Housed in one section of the Engineering Lab, the "train" consists of complete braking equipment for a 200-car diesel freight, including brake units, hose, pipe, reservoirs, and full engine controls. Flags on individual car units indicate braking action and lights in a panel at the controls reveal the sequence in which brakes act. With this setup, company engineers can try out the effects of new or improved designs without jeopardizing costly rail equipment in actual road tests. In the same Lab are two similar setups for different types of passenger equipment.

Helpful Heat-Treat

WHEN consistent surface finishes could not be obtained in precision boring 52100-steel cylinder blocks for aircraft hydraulic pumps, tool engineers at New York Air Brake first suspected that they were using the wrong grade of carbide. Experiments with different grades resulted in no improvement. A check of hardness, however, revealed the source of trouble—variation. Now, all blocks are heat-treated to within 170-201 Brinell and finish is consistently satisfactory with the carbide grade originally employed.

High-School Modelers

FORD MOTOR is producing "picture drawings" and quarter-size models of assemblies for the ready understanding of shop men. High-school graduates in commerical art, *not* engineers, turn them out. They take regular engineering drawings and convert them into perspectives on a special grid paper. Even complicated assemblies can be rendered thus in two days. Bad points in design, layout, and manufacturing can thus readily be seen:

Plaster models are made, new parts covered by a sheet of solvent-softenable plastic, and sheet-like components fastened on. Welding engineers, for example, can immediately visualize how to build fixtures from such a model. Obviously, costs for both types of project are far lower than accepted methods—and errors can be caught before changeover costs are excessive.

Right or Left?

POINTS in research on right- and left-hand motion-time studies by Dickey Dyer of Work-Factor Co., Cleveland, before the AIIE: Time for right-hand and for left-hand motions is essentially the same. Individual motion times are not generally different when performed by one hand with the other idle, or when performed with both hands in motion—unless motions are complex with one or both hands, or are out of phase.

News of Metalworking

McGraw-Hill WORLD NEWS

ROLLS JET ON SABRE FRAME—Australia's new jet fighter will be a Sabre F-86 airframe powered by a Rolls Royce jet, either the Tay or Avon model, packing 50% more thrust than the American Sabre's GE J47. Commonwealth Aircraft Corp. will assemble American airframes and English power plants.

STRESS OF BLADES MEASURED—A new apparatus for measuring stress on blades of gas turbine airplane engines in flight is being used by Rolls-Royce, England. Electric gages are fitted inside turbine blades and connected to a radio transmitter. Readings are received at a ground station and stored by means of a magnetic tape recorder.

NEW GMC PLANT IN BELGIUM—Continental General Motors has started construction at Antwerp of a new automobile assembly plant, and a plant to produce radiators for Chevrolet cars and trucks. Output planned: 120 cars assembled daily; 100,000 radiators yearly.

Defense Production Will Push Ahead This Winter to Make Up Lag

WASHINGTON—Six months behind the schedule set by President Truman and Mobilizer Wilson last year, defense production will get into high gear this winter. The lag is real—from 10 to 20%—but with most of the tooling well on its way, the gap should soon close up.

Two bottlenecks—one a serious shortage of engineers, draftsmen, and designers, the other a shortage of machine tools and production equipment—are outstanding. Controls on three critical materials—steel, aluminum, and copper—are expected to channel all basic vital materials into essential production. Controls on other materials are needed, Wilson's report added.

With tungsten, cobalt, cadmium, rubber, tin, lead, zinc, and other chemicals under control, consumer goods, although many hit a record high in the first quarter, may have to be reduced some.

At present, critical products are:

Electronic devices—in the worst state of any products; have been hampered by redesigning, which has been stopped.

Aircraft—needs tools badly, and has suffered from lack of foresight in materials ordering and over estimation of production capacity.

Tanks—need machine tools, although the new light tank is in production.

Trucks are delayed because of repeated military increases in requirements and because of minor equipment not delivered. Munitions Board has forced accepted delivery of trucks without tarpaulin covers.

New Law Due on Delivered Pricing

WASHINGTON—A new law on delivered pricing and meeting a competitor's price seems well on the way to final approval by Congress.

The new legislation—S. 719 in the Senate, and H.R. 2820 in the House—is designed to write into law a Supreme Court interpretation of the Robinson-Patman law against price discrimination. Last January a majority of the Court said: The Robinson-Patman act as it stands now means that a seller can give one customer a lower price than another—as long as the seller can prove that in all good faith he had to discriminate in order to meet the equally low price of a competing seller.

• **This interpretation** of the law is right in line with the views of many businessmen and Congressmen. They have been pushing the fight for a new pricing law ever since the Supreme Court's 1948 decision against the Cement Institute and basing point pricing. Now, they're trying to get the Court's decision nailed into the law itself. They fear that otherwise the Court may change its mind later on.

But the small-business block is taking up the fight again. They say that the new legislation would make it impossible for the Federal Trade Commission to pin a charge of price discrimination on any seller. All the seller would have to do is make out a case of meeting a competitor's lower price.

Changes in Major Wage Policies Due from WSB by Mid-August

WASHINGTON—The Wage Stabilization Board hopes to conclude formulation of major wage policies by mid-August.

The basic policy probably won't come until last. It is revision of Regulation 6 and reconciling it with Regulation 8. Reg. 6 gives prior approval to general increases up to 10% above the level of Jan. 15, 1950. The 10% will be raised to reflect the rise in living costs over the past six months. Further, the base date probably will be changed to permit employers and unions to use the date of their last wage contract as the base for computing cost-of-living allowance. Reg. 8, which approves escalator wage clauses, will be made to conform with Reg. 6, so that employees covered by them will not have any advantage over others.

Other policies coming out of WSB:

• Standards for health, welfare and pension plans.

• Handling of other major fringe benefits and those which go beyond industry or area practices.

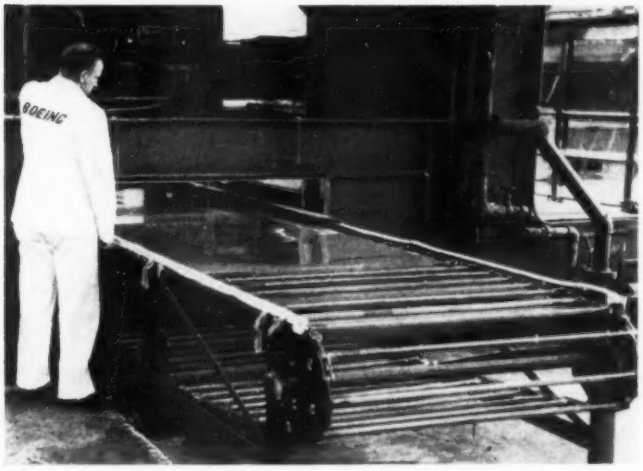
• Approval of any deferred wage increase which is not unstabilizing, i. e., which does not go beyond in increase in living costs.

• Continuation of employee bonus plans where the amount of bonus is not more than, say, 25% of total earnings. Where the bonus is higher, or there is a change in the bonus plan, the employer would have to get approval.

• A yardstick for measuring wage increases which will be allowed as necessary to correct inequities in wage rates between competing plants, so-called interplant inequities.

• Standards and procedures for approving increases deemed necessary to maintain adequate manpower in key defense plants in labor-shortage areas.

• Wage increases which will be allowed for the purpose of correcting substandards of living.



To insure aerodynamic smoothness of aluminum surfaces, Boeing Airplane Co., Wichita Div., applies a protective coating to the metal as soon as it is delivered and after each manufacturing operation. A liquid skin protector, developed by the Minnesota Mining & Mfg. Co., named Orange Dyed No. 968, is sprayed on each sheet to a thickness of .004 in. when quick-dried under infra-red lights, the lacquer peels off like tape

Aircraft Production Board Created to Speed Output

WASHINGTON—To handle lagging aircraft production—now guessed to be about 20% behind schedules—Defense Production Administrator Manly Fleischmann appointed an Aircraft Production Board late in July. Officially the board's assignment will be to control aircraft production for all users—military, commercial, and civilian.

Harold R. (Bill) Boyer, formerly director of production engineering for General Motors, got the job as chairman. He bears the dual title of deputy administrator of NPA for aircraft production. The roster of the Aircraft Production Board includes: Mr. Fleishmann; Delos Rentzel, under secretary of commerce for transportation; John D. Small, chairman of the Munitions Board; Rear Admiral T. S. Combs, chief of the Navy's Bureau of Aeronautics; Maj. Gen. O. R. Cook, Air Force deputy chief of staff for materiel; and Maj. Gen. John K. Christmas, chief of the Army's Procurement Division.

The board will get total requirements for claimant agencies and then set schedules including scheduling aircraft components, materials, expansion of facilities, production equipment, and also recommend conservation measures.

• **First and biggest** job will be to work out the machine tool bottleneck. Tool shortages have hit particularly in jet engine production and now threaten to put the brakes on aircraft deliveries. Some tools will come from the auto industry but Mr. Boyer is primarily stumping for a big expansion in the machine tool industry. Reason is that special alloys used in jet engines plus radically different designs from reciprocating aircraft engines require wholesale numbers of completely new tools.

Mr. Boyer figures that original production schedules, established last winter, were unrealistic. One of the jobs of the Aircraft Production Board will be to bring these schedules in line with physical capacity.

Besides the machine tool shortage, one reason for apparent lag in deliveries has been a breakdown in components deliveries. In many cases, airframes plus engines have come off the line in sufficient numbers but because of shortages of small components, have not been accepted by the military. According to Mr. Boyer, components production is being stepped up and July-August total deliveries will probably pick up the 20% June loss.

The automobile industry probably will not be called on to further cut production in order to provide space to turn out aircraft. Mr. Boyer pointed out that a 50% drop in auto production would release only 10-15% of plant floor space which wouldn't materially help plane production.

Plants Purchased

• **Continental Can Co.,** New York, has purchased Dixon Mfg. Co., Inc., Coffeyville, Kan., contract manufacturer of aircraft components, to be operated as a wholly-owned subsidiary. The Dixon plant at McGugin Air Base is a major producer of components for the B-47 program, as well as spares for the L-5, B-50 and B-29 programs.

• **Stronghold Pacific,** western division of Stronghold Screw Products, Chicago, has purchased Riveo, Inc., Downey, Calif., manufacturer of rivets and screws for the automotive and aircraft industries.

• **Rheem Mfg. Co.,** San Francisco, has purchased controlling interest in James Graham Mfg. Co., pioneer maker of gas ranges on the Pacific Coast. Graham will continue manufacture and distribution of its Wedgewood stove, while Rheem's research and development facilities and nation-wide sales organization will strengthen Graham's competitive position.

• **Skilsaw, Inc.,** Chicago, has purchased controlling interest in Loud-Wende, Inc., Middleport, N. Y., manufacturer of circular wood saws, dado sets and industrial knives.

• **Precision Tool & Die Co.,** Bronson, Mich., has been purchased by Oliver Goshia, former Toledo stock broker, who will be active in the firm as vice president and treasurer. Otto A. Rissman will continue as president.

• **Airquipment Co.,** Burbank, Calif., subsidiary of Lockheed Aircraft Corp., has been purchased by Weber Showcase & Fixture Co., Los Angeles. To be renamed Weber Aircraft Corp., the new company will carry on operations of both Airquipment and the aircraft division of Weber.

Plant Expansion

• **Bay State Abrasive Products Co.,** Westboro, Mass., has begun a $1,200,000-expansion program. Of the total, approximately $700,000 will be for extension of present factory and storage buildings. The balance is to be used to purchase new equipment, including a new 280-ft long, high-temperature tunnel kiln.

• **McCulloch Motors Corp.,** Los Angeles, has purchased the plant formerly occupied by Davis Precision Products in the San Fernando Valley district of Los Angeles and will use it for its aircraft division.

• **Nice Ball Bearing Co.,** Philadelphia, has completed additions to its plant that will enlarge manufacturing space by 9150 sq ft and add 5400 sq ft of storage space.

• **General Electric Co.** has expanded its plastics mold-making facilities, with a modernized toolroom, located in Pittsfield, Mass., covering 40,800 sq ft. Machinery, capable of tooling large molds, has been installed in anticipation of the trend for larger plastics moldings.

• **Avey Drilling Machine Co.,** Covington, Ky., will expand its plant by 16,000 sq ft, at a cost of about $300,000. Avey will celebrate its 45th anniversary this coming year.

Machine Tool Builders Protest New Price Regulation as 'Profit Control'

CLEVELAND—The recently issued OPS regulation entitled "adjustment of ceiling prices of machine tools" is not price control but a "blatantly transparent mechanism for the control of profit," charged Frederick S. Blackall, Jr., president of Taft-Peirce Mfg. Co. and vice president of National Machine Tool Builders' Association in a letter sent to Senators and Congressmen in Washington.

Under this "General Overriding Regulation 15" a machine tool company computes its average rate of return on total assets from 1938 to 1948 and is then permitted to realize 80% of this rate when applied to its total assets today. Working backwards from the allowable percent of profit, the manufacturer may fix his prices for twelve months ahead at levels which he estimates will yield the profit allowed. If, however, the profit turns out to be over 5% in excess of the rate allowed, the excess must be refunded to customers, Mr. Blackall explained.

• **The machine tool builders** do not approve of "any such dangerous excursion into socialistic philosophy," Mr. Blackall declared, citing some of the objections:

1. The refund provision is equivalent, in effect, to a 100% excess profits tax administered by OPS.

2. The regulation puts a floor under earnings of the inefficient and high-cost manufacturer.

3. It does not carry out the directive of the Office of Defense Mobilization. It neither stimulates production nor provides incentive.

4. It tends to limit, rather than to expand the productive efforts of the efficient manufacturer, for it would offer him no incentive to increase operations and output beyond his own convenience.

Mr. Blackall urged, in closing his letter, that the legislators "institute steps to withdraw this highly dangerous regulation."

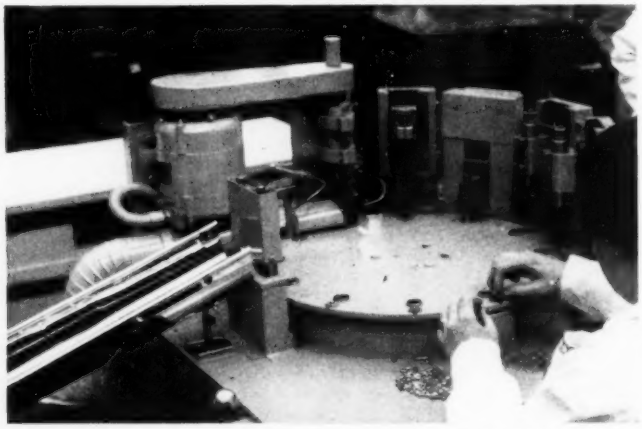
Contract Termination Law Not Settled

WASHINGTON — Contract termination is still a controversial subject. Defense Dept. is holding out for a firm, fast, and final policy, claiming it's an injustice to military contractors to have a contract termination policy that permits reopening long after the contracting agency has closed the books.

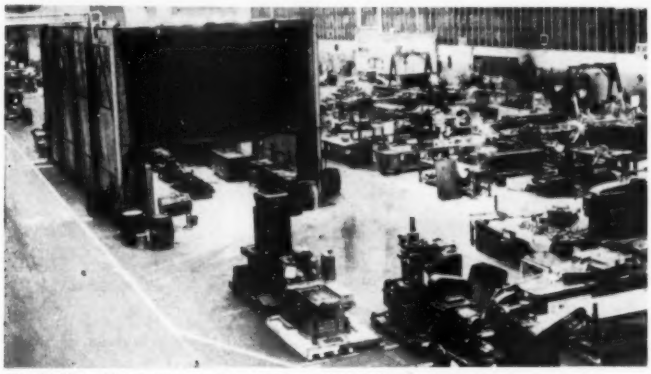
But the Comptroller General wants to post audit terminations. Present law permits reopening a termination where there is suspicion of fraud. Thus, in theory, a cry of "fraud" is enough to post audit any termination. During the last war, this practice got so out of hand that many terminations by the military were, in effect, only temporary closings of the contract.

Military specifically wants words "firm, fast, and final" in the termination regulation, claiming that with such a policy only the very largest contracts should take more than 45 days to clear up. Now, contractors can be tied up for months with government materials and tools in their plants while General Accounting Office investigators determine whether there has been a fraud in terminations.

The military will probably win out in the long run. Meanwhile, the regulation still remains in the proposed stage although it was approved by industry advisory committees and procurement officers by last March.



Soft metal slug is automatically peened down into a conical hub to effect assembly of hypodermic needles. The machine is of British manufacture, and is designed to rivet and re-rivet the slug, stamp a number on the hub, ream the hub and blow out the chips, and automatically eject the finished work



World War II machine tools are cleaned, repaired, rebuilt

They're stored and cataloged for easy selection by a contractor

Rail facilities in warehouses permit prompt shipment to contractor

Select Tools 'Cafeteria Style'

DAYTON—Air Force contractors now can pick out in person machine tools from the Air Force reserves in storage at Marietta, Ga., and Omaha, Neb. and put them to work. The "cafeteria style" plan replaces the former method of selecting machines from stock record cards, with physical selection minimized.

Three conditions are laid down by the Air Force: (1) the contractor must be at work now on Air Force order; (2) he must hold a facilities contract; and (3) he must have a real need for the machines.

After the contractor has selected the machines he wants, he merely tells the Air Force where he wishes them shipped.

• **Procedure** for obtaining tools needed is essentially this: Make your request, submitting five copies of the machine tool and equipment portion of your approved facility appendix. When you receive an authority number, screen your requirements against available new tool and excess tool lists maintained by the Air Force. If the machines wanted are in stock, a date will be set for you or your representative to visit either Marietta or Omaha.

The Air Materiel Command's Industrial Equipment Section at Wright-Patterson Air Force Base here has been responsible for preservation and storage of billions of dollars worth of high-production machines since World War II. Types of machines cover every phase of aircraft production: grinders, millers, lathes, drills, routers, press brakes, screw machines, and special machinery.

The machines have been maintained in prime condition, covered with an AF-developed preservative, and stored in warehouses kept at constant temperature and humidity.

Reopen Aircraft Plant

CHICAGO—Fairchild Engine & Airplane Corp. has taken over manufacturing facilities at O'Hare International Airport for production of C-119 cargo packet planes. Fairchild will rebuild and equip the O'Hare facilities under a $20-million dollar Air Force contract. The buildings at O'Hare were used in World War II for making C-54 transports by Douglas Aircraft Corp.

Edward P. Bullard, III

William E. Saupe

Will Pruessman

J. M. Rudel

Names in the News

Edward P. Bullard, III, has been appointed manager, North Haven, Conn., plant, Pratt & Whitney Aircraft Co. Mr. Bullard has been associated with the Bullard Company of Bridgeport, Conn., for the past 18 years in the design and manufacture of machine tools. He was assistant general manager, vice president-manufacturing, and a director of the Bridgeport firm.

William J. Fleming has been appointed manager, Construction Equipment Sales Div., Worthington Pump & Machinery Corp., Harrison, N. J. **John S. Bachman** has been named assistant manager of the sales division. **E. A. Murray** has succeeded **Herman H. Miller** as manager of Worthington's, Compressor Div., Buffalo, N. Y. Mr. Miller will remain in a consulting capacity.

Russell J. Wolf has been named vice president in charge of sales, M. W. Kellogg Co., New York. He was formerly assistant to the president of the firm. **Donald W. Champlin** was named vice president in charge of Kellogg's manufacturing. Mr. Champlin was formerly general manager of the Equipment Manufacturing Div., Continental Can Co.

Geoffrey G. Beard, executive vice president of United Engineering & Foundry Co., Pittsburgh, Pa., has been elected to the executive committee of the Machinery & Allied Products Institute, Washington, D.C., for the fiscal year 1951-52.

W. C. Richards, Jr. has been named executive assistant to the president, The Bellows Co., Akron, Ohio. He has been with the firm since 1947.

William E. Saupe has been appointed operation manager, and **Will Pruessman** has been named manager of manufacturing, Schenectady Steam Turbine and Generator Div., General Electric Co. Mr. Saupe has been with GE since 1917, and since 1947 has been manager of the Turbine Mfg. Div. Mr. Pruessman joined the company in 1925 and was named superintendent of the Turbine Mfg. Div. in 1948. **Ralph E. Carter,** a purchasing agent for the General Electric Co., has retired after 46 years of service.

Paul M. Fischer has been named chief methods engineer, Hyster Co., Portland, Ore. He was formerly factory manager of the company's Peoria plant and in that position will be succeeded by **W. H. Neptun.**

Howard W. Earnshaw, vice president and member of the board of directors, Jaeger Machine Co., Columbus, Ohio, has resigned.

Al Soderquist has been named administrative engineer, Boeing Airplane Co., Seattle, Wash. He was formerly staff engineer. Other Boeing changes include: **George Schairer,** formerly aerodynamics and power plant staff engineer, was appointed chief of technical staff; and **George Martin,** formerly chief project engineer for the B-47, was named chief project engineer aircraft.

Robert D. Turner has been appointed secretary-treasurer, Marvel-Schebler Products Div., Borg-Warner Corp., Decatur, Ill. He succeeds **Walter E. Walpole,** resigned. **Donald N. Arndt** was named general sales manager for the division.

J. M. Rudel, president of Rudel Machinery Co., Ltd., Montreal, Canada, has been elected president of the Canadian Machine Tool Dealers Association. **A. Williams,** A. R. Williams Machinery Co., Ltd., was elected vice president. Directors are **F. W. Wilson,** Williams & Wilson; **G. Wyer,** Canadian Fairbanks-Morse Co., Ltd.; and **W. W. Muirhead,** A. C. Wickman, Ltd.

Robert R. Simons has been elected vice president, Sharonsteel Products Co., a warehouse subsidiary of Sharon Steel Corp., Sharon, Pa. He succeeds **T. J. Moore, Jr.**

Leonard J. Fletcher has been elected a vice president, Caterpillar Tractor Co., Peoria, Ill. He joined the firm in 1927 and since 1941 has been director of training. **C. E. Jones,** formerly manager of Caterpillar's sales development division, was named parts manager. **George P. Fenn,** former assistant manager of sales development, was named manager of the division while **Robert D. Evans,** the division's supervisor of tractor and equipment operation, was appointed assistant manager.

Fred Brink Jr. has been named general sales manager, Brink & Cotton Mfg. Co., Bridgeport, Conn.

Dr. C. J. Breitwieser has been named executive assistant to the vice president in charge of engineering, P. R. Mallory & Co., Inc., Indianapolis, Ind. He was formerly chief of electronics and head of the engineering laboratories, Consolidated Vultee Aircraft Corp., San Diego.

John M. Robinson, vice president-finance, DeVilbiss Co., Toledo, Ohio, was elected a member of the board of directors of the firm.

John E. Renner

John E. Renner has been appointed general sales manager, Lincoln Engineering Co., St. Louis, Mo. He was formerly sales manager of the automotive division of the company.

Don M. McCutcheon has been named manager, physics department of Ford Motor Company's scientific laboratory, Detroit. **William C. Ford** was appointed manager of the quality control department of the gas turbine plant of Lincoln-Mercury Division's defense production operations.

Robert L. Gibbs has been appointed manager of sales personnel, Mueller Brass Co., Port Huron, Mich.

C. B. Schmidt has been elected president of DeLaval Separator Co., New York. He joined the firm 29 years ago. In 1945 he was named a vice president. **Geo. C. Stoddard,** who retires as president and director after 30 years with the company, will continue in an executive advisory capacity. **George W. Smith** was elected board chairman.

William M. Hawkins has been appointed senior research engineer at New York in the research and development department, American Car & Foundry Co. Mr. Hawkins was formerly director of ACF's laboratory at Berwick, Pa. and in that position will be succeeded by **George Reed.**

Frederick W. Timmons, Jr. has been appointed regional sales manager, Cathode-ray Tube Div., Allan B. DuMont Laboratories, Inc., Clifton, N. J.

Edison C. Sickman has been appointed general sales manager, Atlas Mineral Products Co., Mertztown, Pa. **George Gabriel** has been named plant manager for the firm.

Robert N. Nelson has been named assistant sales manager, Pneumatic Div., Sundstrand Machine Tool Co., Rockford, Ill. He was formerly sales engineer for Sundstrand.

B. W. Rose, until recently manager of the Ford Division assembly plant in Memphis, Tenn., has been named manager of Ford's new Kansas City Aircraft Plant, now under construction, where wing sections for B-47 stratojet bombers will be built. **Ben D. Mills,** manager of the production programming and control department of Ford Div. manufacturing operations, will become assistant manager of the new plant. **Alfred D. Weir,** formerly chief industrial engineer with Fairchild Aircraft Co., was named production manager. The plant will be under direction of the division's Defense Production Operations, of which **W. D. Singleton** is manager.

James A. Mason, chief project engineer, Warner Electric Brake & Clutch Co., Beloit, Wis., has transferred to Machinery Electrification, Inc., Worcester, Mass., the New England outlet for Warner. He will serve as assistant manager.

Roy P. Tooke has been appointed maanger and **E. T. Mitchell,** general superintendent of the Butler Div., Armco Steel Co., Butler, Pa. Mr. Tooke succeeds **J. Gordon Gage,** deceased.

Warden F. Wilson, general sales manager of Lebanon Steel Foundry, Lebanon, Pa., has been elected president of the Alloy Casting Institute. **H. T. Harrison,** vice president of Duraloy Co., Scottdale, Pa., was elected vice president; **G. A. Baker,** vice president of Duriron Co., Inc., Dayton, and **J. S. Wooters** of General Alloys Co., Boston, were elected to three-year terms as directors.

William Townsend has been advanced to vice president of Pennsylvania Flexible Metallic Tubing Co., Philadelphia. He was formerly vice president in charge of sales. **Charles W. Strine,** controller, was named treasurer. **Charles W. Young,** plant production manager, was named vice president in charge of production. **Emil Haegele** was appointed master mechanic.

Major General R. C. Coupland (USAF retired) has been appointed manager of the product development department, Metal Products Div., Koppers Co., Inc., Baltimore, Md.

Charles H. Gallaway, president, American Optical Co., has been re-elected president, Industrial Safety Equipment Association, New York. Elected to the vice presidency was **Earl H. Brooks** of Safety Clothing & Equipment Co. **Jess A. Brewer,** Industrial Gloves Co., and **G. M. Glidden,** Acme Protection Co., were elected to the board of trustees.

Byron Stoothoff has been appointed manager of the Cincinnati plant, Cleco Div., Reed Roller Bit Co., Houston, Texas.

OBITUARIES

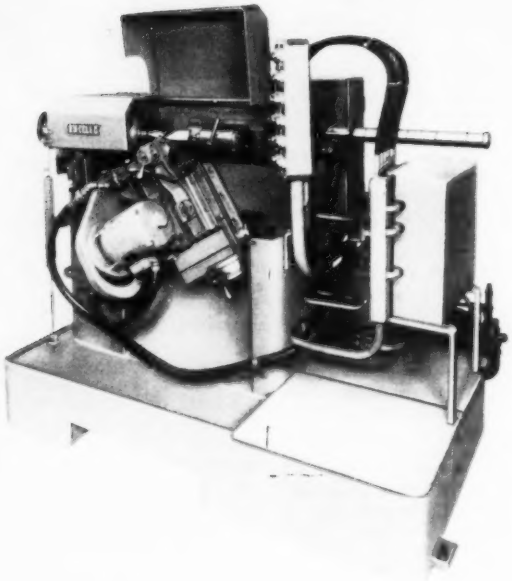
Charles B. Cole, 62, president for 30 years of Tool Equipment Co., Chicago, died July 23. He was active in engineering societies, and authored a number of articles and texts on toolmaking and tool design.

William E. Herb, 61, vice president and general sales manager of Gifford-Wood Co., Hudson, N. Y., died July 3. He joined the firm in 1916, became district sales manager at Pittsburgh in 1925, and in 1929 was named sales manager, eastern division, at New York. He was named general sales manager in 1947, and was elected vice president March of this year.

William C Johnson

William C. Johnson, 49, executive vice president of Allis-Chalmers Mfg. Co., Milwaukee, since February of this year, died July 26. He joined Allis-Chalmers in 1924 as a machinist's helper. In 1942 he was named general sales manager, general machinery products. He was named vice president, General Machinery Div., in 1944, and was appointed executive vice president for the division in 1947. In 1948 he was elected head of the board of directors.

New Shop Equipment



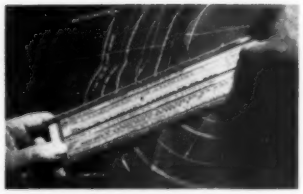
Airfoil-Form Grinder For Jet-Aircraft Compressor Blades

The machining cycle is completely automatic except for loading the work, pressing the start button and unloading the work at the end of the cycle. Blades are located from the finished root form at one end and from a center in the other end. Accuracy of airfoil form is assured by the use of master cams made directly from the engineer's glass layouts. The coolant equipment also has automatic stop and start controls.

Known as the Style 87, the machine grinds the complete airfoil form including leading and trailing edges. As the work rotates it moves lengthwise across the grinding wheel at an adjustable rate of feed. Because the area of contact between the work and grinding wheel is very small at the leading and trailing edges and quite large at the broad sides of the blades, the work speed changes as the blade rotates. A two-speed work-drive motor slows down while the wheel cuts the broad sides of the blades, then speeds up while the narrow edges are being ground. Thus there are two periods during which the fast speed is used and two periods of slow speed during each revolution, insuring a uniformly fine finish.

Grinding spindles are available for any speed required and for any practical wheel size. The grinding wheel is dressed with a hand-operated, swivel diamond dresser. The amount of stock dressed off the wheel is compensated for by the wheel moving toward the work an equal amount. The wheel can be advanced or retracted without changing its position to the dresser.

Ex-Cell-O Corp., 120 Oakman Blvd., Detroit 32, Mich.



Gisholt Time Computer

Plastic slide rule enables you to find spindle speed or production rate quickly and accurately.

To find spindle speed you need the cutter diameter and the cutting speed. Or, inversely, you can find either of the other two by knowing the spindle speed and the other component. To find the production rate you need the spindle speed, length of cut, and feed in ipr. Or to find any one component, you need the other three.

On the reverse side is a chart giving decimal equivalents of parts of an inch. Price for the slide rule—$3.

Gisholt Machine Co., Madison, Wis.

Lyon Tool Stands

Intermediate trays on this tool stand are interchangeable and punched for attachment of drawers. The drawer has a padlock attachment and a sliding tool tray. It operates on ball-bearing rollers. The tool stand is available in either stationary or portable models. With casters it is 37⅛ in. high. Trays measure 20x28 in. and 24x36 in.

Lyon Metal Products, Inc., Aurora, Ill.

Materials and Parts

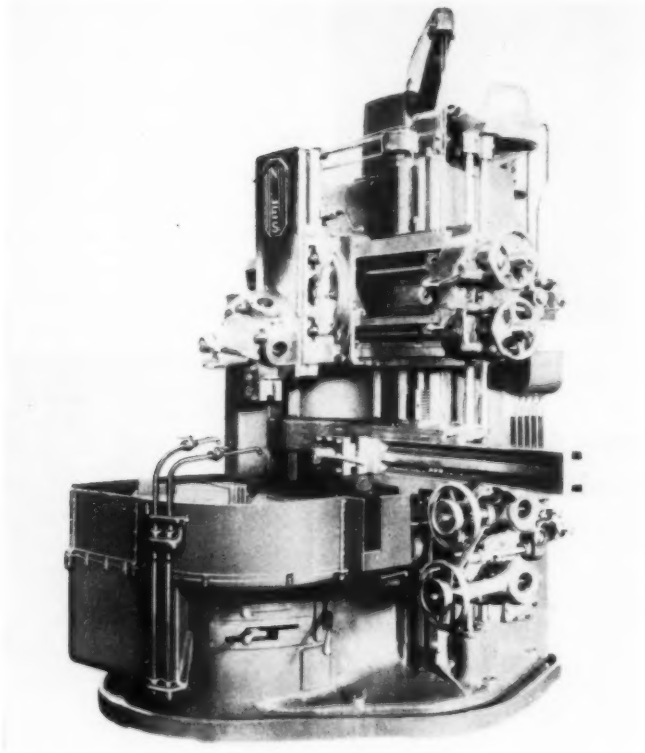


Table Speeds Increased on Niles Vertical Boring Mill

Swing (with side head down)	50 in.
Vertical head slide travel	28 in.
Vertical-head swivel	90° total
Side-head vertical travel	35 in.
Side-head horizontal travel	21 in.
Table speeds	12, from 9 to 200 rpm
Feeds, both heads	16, from 0.003 to 0.52 ipr

This improved 42-in. vertical boring and turning mill with side head has the following changes: (1) Increased table speeds and corresponding feed changes; (2) Antifriction bearings in the table speed-change gear-box and table mounting; (3) Higher-powered drive from a 30-hp motor.

The machine has independent or simultaneous engagement of down and cross feed or power traverse for both rail and side heads. Centralized and simplified controls for multiple tooling make it adaptable to job shop or quantity production.

The column and base are integrally cast, giving good rigidity. A three-track crossrail assures alignment between crossrail and table. An elevating screw adjacent to the narrow guide prevents tilting and binding. Wear of moving parts can be compensated.

A center stop locates the railhead and maintains alignment between it and the center line of the table spindle.

Maximum distance from table top to turret face is 48 in. The machine occupies a floor space 8 ft 4 in. wide

... INCLUDING

Universal Masterhead is multi-purpose tool. Coming in seven sizes to handle diameters up to 24.4 in., it is supplied with standard shanks page 154

Redesigned mechanical toolholders for carbide bits leave face of bit open so chips can curl around it, reducing erosion page 160

Oxygen-argon mixture for welding atmosphere greatly increases rate of droplet formation to allow faster welding without undercutting page 154

Etamic gages for a wide variety of uses, from gaging and sorting to calibrating, are French-made. Accuracy within 1/1000 of a mm is claimed page 155

Surge-dampening valves can prevent shock in hydraulic systems by applying uniform acceleration principle page 156

Variable-speed unit drives steel turning rolls that can rotate up to 150 tons when six roll units are ganged together page 158

NEW BULLETINS for your shop library include a 20-page booklet giving design features of tool- and die-milling machines for duplicating pages 161 & 162

... and in August 20

Automatic screw machine has a sliding head operated by cams. It permits the bar to be guided by a bushing right in front of the tools

Injection-molding machines are constructed with tie rods instead of the usual frame. Clamping pressure is 600 tons

by 8 ft 10 in. deep and stand 10½ ft high.

Accessories include a 3-jaw combination chuck or plain table in place of 4-jaw independent chuck, a taper-turning attachment for the side head, thread-cutting attachment for either head, cutting-fluid attachment, profiling attachment and fixtures and tooling.

Baldwin-Lima-Hamilton Corp., Hamilton, Ohio.

The left drawing shows metal droplets being transferred in an oxygen-argon atmosphere. The drawing on the right simulates the arc of pure argon. The conditions illustrated are for identical current densities and weldng rod sizes. The difference in rate of droplet formation is something like 50 to 1 for the oxy-argon

Oxygen-Argon Mixture Speeds Sigma Welding of Steels

A new principle multiplies the speed of sigma (shielded, inert-gas metal-arc) welding of stainless and carbon steels. A mixture of oxygen and argon is used as a shielding atmosphere. Earlier research had shown that for best welding conditions, metal transfer consists of a series of discrete metal droplets propelled at a high velocity. Droplet formation varies with different metals and for different current densities.

It is reported that the droplet rate, particularly on stainless and carbon steels, can be increased by the addition of a small percentage of oxygen to highly purified argon. The droplet rate in this oxy-argon mixture has been as much as 50 times greater than in an atmosphere of pure argon, other conditions being the same.

This greatly increased droplet rate, with no change in current density, permits welding at higher speeds without undercutting. Coalescence of the weld metal is improved at the increased speeds. Overhead welding of stainless is now practicable.

Or, in reverse, the oxy-argon mixture can permit welding at lower current densities. This means that larger-dia, more-economical rods may be used for a given welding current. If the same-size rod now available is used, then thinner materials can be welded.

The oxygen-argon mixture has been introduced as Linde Argon-Sigma grade. Its price will be the same as for Linde Argon, standard welding grade.

Linde Air Products Co., Div. Union Carbide and Carbon Corp., 30 E. 42nd St., New York 17, N.Y.

Delta Drill Unit has Air Thrust, Hydraulic Control

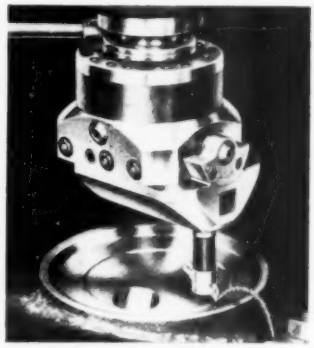
The No. 19-400 drill unit is designed for heavy-duty drilling, reaming, tapping, centering, chamfering, spot facing, etc. Thrust is derived from the plant compressed-air supply and the control from a sealed hydraulic system.

The spindle is driven by an electric motor either directly, through a gear train, or by V-belts. The unit may be mounted in any position because of its sealed construction.

Adjustment for rapid approach, feed, and final depth are grouped at the front of the unit. The length of the approach and total stroke are controlled by positive stops. Approach to work is possible to 0.005 in. at 5 ips rapid traverse and final depth can be controlled to within 0.0005 in. Feed is infinitely variable from 0 to 50 ipm. At the end of stroke the unit returns at 4 ips. Full stroke is 4 in.

Built-in switches can be used to interlock the drill unit with index tables or other units. Equipment is available to feed on the backstroke for tapping, threading, and back spotfacing. Tapping and threading are done by floating tap holders. The unit will take up to ⅝-in. drill in steel.

Delta Power Tool Div., Rockwell Mfg. Co., 600 E. Vienna Ave., Milwaukee 1, Wis.



Boring and Facing Head With Automatic End Release

The Wohlhaupter universal Masterhead can be used for boring, facing, recessing, undercutting, taper and form turning, and threading. Integration of shank and body results in a sturdy tool suitable for both heavy and light cuts.

The slide feeds have automatic end release. The end release can be adjusted for specific cutting pressure, or to release when excessive pressure results from dull, broken, or hooking tools.

Tapers may be bored by using crossfeed in conjunction with axial feed of spindle or table.

The unit is available in seven different sizes to cover a range of diameters up to 24.4 in., and can be supplied with standard Morse or Brown & Sharpe shanks.

Models UPA1, UPA2, and UPA3 are for dias up to 10.2 in., and are

equipped with automatic slide feed. Coarse and sensitive settings are made by a graduated collar. One increment corresponds to a slide feed of 0.0005 in., or 0.001 in. on diameter. One revolution equals 0.20 in. or 0.40 in. on dia.

The automatic cross traverse feed of 0.002 in. per rev, or 0.004 in. on dia, is engaged by means of the retaining ring or the stop rod and feed button. The cross-feed traverse is set for any desired size by means of an adjustable stop. When reaching the stop, a clutch is automatically released, thus disengaging the traverse. By pushing the button for the return movement, the movement of the slide is engaged at a feed of 0.20 in. or 0.04 in. on dia, without stopping the machine spindle. End position of return movement is limited by a second stop.

Models UPA, UPA4-S5, UPA5, and UPA5-S6 are designed for work up to a dia of 24.4 in. and have automatic slide feeds of 0.00125, 0.0025, 0.00375, and 0.0050 in., respectively. The feeds are engaged by means of the retaining pin and the pushbuttons; the feed-control collar kept in place by hand or stop rod. Return movement of the slide is engaged by reversing the facing traverse or by turning the quick-setting screw.

Karl A. Neise, Dept. AM, 381 Fourth Ave., New York 16, N. Y.

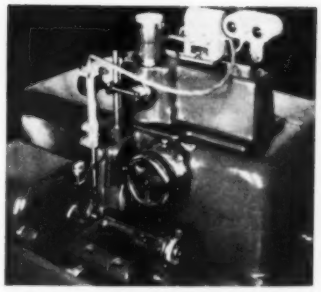
Gorham Alloy Centers Have Deep Wear-Resistant Core

These wear and abrasion-resistant centers, are said to outlast high-speed and other alloy centers three to ten times before redressing.

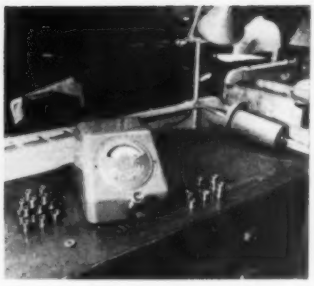
"M-40-U", a wear- and abrasion-resistant material, forms a core that is inducton brazed into the steel shank of the center, after which the entire center is finish ground. Thus, the wear material is always supported by the tough shank steel. These centers require only a cleanup grind when wear finally occurs.

The centers and half-centers are available with Morse, Jarno, or Brown and Sharpe taper shanks, in lengths from 3 5/8 through 12 3/4 in.

Gorham Tool Co., 14400 Woodrow Wilson Ave., Detroit 3, Mich.



The Etamic gage, mounted on a Landis grinder, automatically stops the machine when part is finished. Accuracy of gaging final dimension is to 1 micron.



The gage can, in another model, be used to check parts. It gives a direct reading of the size of a piece on a micron-graduated scale.

Differential Pneumatic Gage Stops Grinder at Right Size

Etamic gages can be put to a wide variety of uses. The different models are employed for: gaging and tripping operations on centerless, internal, and external grinders; as an automatic measuring device; for automatic sorting; wire and band calibrating, and for the gaging of a given size with a given tolerance.

The gage consists of a U-shaped tube with a manometric diaphragm in a bypass across the middle of the U. There is a calibrated orifice in each side of the U. The work is at one open end of the U and a needle valve at the other—forming two more orifices. For a given distance of the work from the tube end there is a value of the needle valve at which leaks through the open tube ends will be equal. In that case the pressure on both sides of the U is equal. Under such conditions the diaphragm will be in its central position and the two electrical contacts it operates will be open. If the work is at some other distance, pressure will be unequal and the diaphragm keeps one contact closed. The position of the needle valve is indicated on an integral dial and depends upon the piece to be measured. A previous calibration determines this size. Compressed air is supplied to the U from the plant air line.

A good example of the gage is the S-Type for external cylindrical grinding.

(1) **With a non-automatic grinder**—for trueing down to a predetermined diameter on shafts, the procedure is as follows: The gage is locked in position on the machine and adjusted for a given diameter. A gaging fork is set over the part to be trued and down or longitudinal traverse started.

During the start, a green signal light is on. When within 100ths of a mm of final dimensions, the signal light shuts off and warns the operator. He then decreases the feed and stops the grinding wheel when a red light comes on.

(2) **For automatic grinder**—Automatic stop is realized in one or two stages depending upon finish and accuracy desired. With the one-stage stop, the gage closes an electro-magnet circuit controlling the stop valve, traverse is discontinued, and the grinder backs off. In the two-stage stop, the first action takes place when near 1/100 mm. of final dimension. A circuit opens and stops, through electromagnets, the fast roughing traverse, giving way to a slow finishing traverse. When the final dimensions are reached, a second circuit closes, stops traverse, and operates the fast backing off of the head. Accuracy is claimed to be 1/1000 of a mm. (micron).

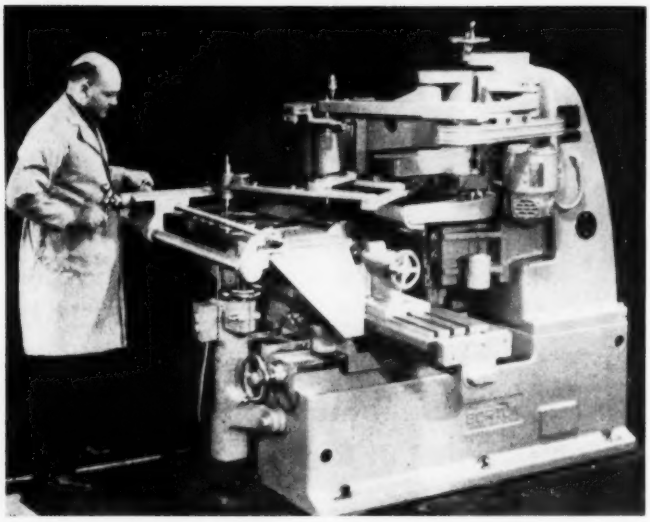
The gages are French-made, the company being the Ateliers de Normandie in Paris. Sales are being handled by Landis Tool.

Landis Tool Co., Waynesboro, Pa.

Bolt fastener has a self-locking sleeve. It eliminates the helper required in inserting and tightening up the conventional bolt and nut.

The bolt is inserted in the hole—a pneumatic tool driving the bolt through the sleeve and expanding 6 prongs at the bottom. This forms a grip which cannot work loose through vibration. The bolt head countersinks itself in the wood surface.

Square Tool & Die Co., 1550 N. Fremont St., Chicago 22, Ill.



Gorton Pantograph Machine For Milling Around Cylinders

Wherever rolls are used to press, stamp, print, emboss, deboss, and diecut, this machine is claimed to perform exact work in a fraction of the ordinary time and with semi-skilled operators. In addition, the various machine components can be modified so that the ratio of reduction, range, and roll diameter can be changed.

The engraver accommodates rolls (ferrous or non-ferrous metal and plastic from 6 to 12 in. in dia and up to 40 in. long. The work is held between centers as on a lathe. Forward and back movement of the tracer automatically rotates the roll. Longitudinal, left-to-right, movement of the tracer does not rotate the roll. Thus, the cutter point is always centered over the axis of the work.

Maximum area covered by the cutter at one setting is 5x20 in. A master pattern is cut in either sunk or relief form and twice the desired size. Only a small section is required if it is to be repeated over the whole roll. The master is clamped to the table at the front of the machine.

Repeating the master to ½ size is accomplished by indexing the work piece as each segment is completed. This is done by simple adjustment of the headstock drum. For heavy roughing cuts, a built-in manual scanner is furnished into which the tracing spindle is clamped. It is manually operated by means of longitudinal and traverse feedscrews.

The roll is rotated by a compensating mechanism — eliminating the need for change gears. To feed the cutter spindle down, or release it, either a toggle switch on the tracer spindle or a foot switch is furnished. The cutter spindle has a 1-in. vertical micrometer adjustment.

The spindle is belt driven by a ½-hp variable-speed motor, dc, which provides infinite speeds of from 500 to 12,000 rpm. The roll is held on centers rotated automatically during cutting by the headstock drive. Rotation is synchronized with the cross movement of the tracer spindle.

George Gorton Machine Co., Racine, Wis.

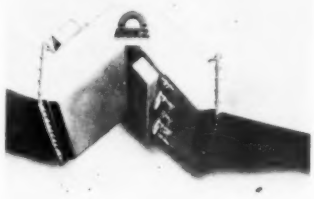
Surge-Damping Valve Prevents Shock in Hydraulic Systems

These small valves can be installed as easily as any ordinary fitting. Applications include: installation at the ports of 4-way valves; in a cylinder circuit as an automatic decompression valve; in any line leading from an accumulator; and in other locations.

A uniform acceleration principal is used. The valve adjusts itself automatically to any working pressure and requires only a fraction of a second to act. It prevents the damaging vibrations caused by sudden starting, or reversing flow. A normally closed valve, it gradually opens when pressure is applied to the inlet side. When the flow is interrupted, the valve quickly rests and is ready for the next operation.

The spool inside is normally held closed by a spring to prevent flow from inlet to outlet. It moves to fully-open position at a rate controlled by a small, built-in valve that is responsive to the difference between outlet and inlet pressures. The valve opens at a slower rate of speed at high pressures than at low pressures, when the valve is subject to sudden surges of fluid. Also, the rate of flow will increase as the pressure in the outlet line of the valve approaches that at the inlet side.

Dennison Engineering Co., Columbus, Ohio



Tramp Iron Separated From Gravity Lines

The standard Magnetic Hump, when installed vertically, can remove tramp iron from heavy loose-flowing materials conveyed in downspout. In it, baffles direct material flow 30° from the normal straight line so that non-electric Atomagnets installed on opposite faces of the hump can set up a magnetic barrier in tandem.

"Atomagnets" are improved permanent magnetic separators. Features are: riveted construction for increased rigidity; continuous hinge of non-magnetic aluminum for ease of cleaning and for longer service; formed aluminum cover to prevent accumulation of iron on backs of castings with consequent loss of magnetic strength.

The humps are stocked in sizes from 4- to 40-in. chute widths and may be built larger for special applications. Adapters for round or rectangular openings are available.

The Eriez Mfg. Co., Erie, Pa.

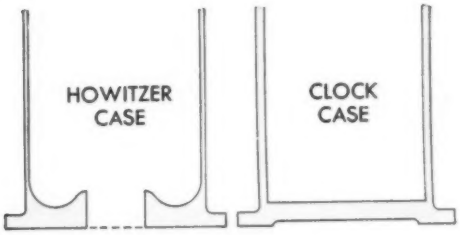
Chelsea Ship's Bell Clock, The Vanderbilt model, made by Chelsea Clock Co., Chelsea 50, Mass. Case drawn in one piece out of commercial brass by Worcester Pressed Steel Co., Worcester 6, Mass.

War Baby grows into a Clock Case

During the War, the Worcester Pressed Steel Co. worked out a technique for forming 4.5 howitzer shell cases of cartridge brass. The case was 3¾" high, 4¾" o.d., with thin walls and thick base that included a difficult flange, the material for which had to flow entirely from the base of the cup. The successful solution of the many problems required careful tool design, plus skilled control of each operation.

Later the Chelsea Clock Co. asked Worcester if it could cold-form clock cases out of commercial brass. A study of the clock case revealed striking similarities between it and the howitzer case, but on the other hand there was one important difference. The large radius on the inside of the howitzer case was not permissible in the clock case, because of the space required for the works. It was found that the bottom design could be achieved by squaring the case to the exact height, providing the bottom knockout with exactly the correct amount of spring tension in the restrike, and carefully governing the pressure and speed of press travel. The complete coordination of these factors resulted in a perfect case, and another example of the adaptation of war-learned skills to peace-time products.

• If you have problems in connection with the fabrication of copper and its alloys, or aluminum alloys, remember that the Revere Technical Advisory Service often can be helpful.



Cross sections showing similarities and differences between the howitzer case and the clock case.

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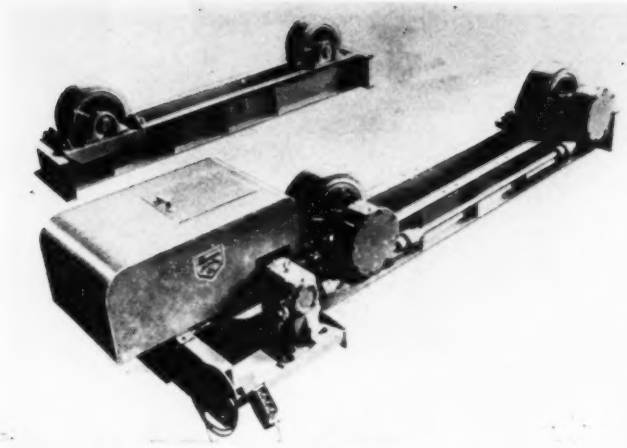


Worthington Turning Rolls Driven by Variable-Speed Unit

The Model 75 PR turning roll has rubber-tired rollers and a turning capacity of 75 tons. The load is distributed among three units — one power roll and two idler rolls, each having a 25-ton capacity. With steel rollers, the capacity is increased to 150 tons. Here, the load is distributed among six units — one power roll and five idler rolls, each for 25 tons.

The motor-driven rolls are run by an enclosed variable-speed unit, with a range of speeds to meet individual job requirements. The center-to-center distances of the rollers can be changed for handling work of various diameters.

The wormwheel is mounted upon two taper roller bearings with provisions allowed for adjustment purposes. The wormwheel rim is of high-strength bronze alloy and supported by a steel hub.

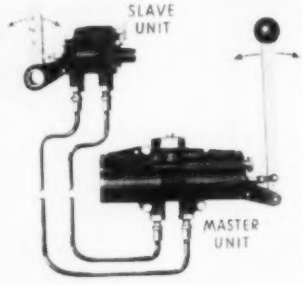
The outboard roller unit is adjustable at appropriate center-to-center distances between rollers, thus allowing the handling of various diameters of tanks. Stops are spaced on the frame itself to locate the roller unit and prevent the sliding of bearings under load.

Removable drive shafts are provided in three variable lengths which may be used in different roller positions. Shafts not in use are stored on racks which are located on the side of the frame.

The drive shafts are connected by means of chain-type flexible couplings which are self-aligning. This arrangement provides for a quick means of changing the shafts when increasing or decreasing the distances between rollers.

An intermediate worm-gear drive is used between the variable-speed drive and the roller drive. The variable-speed drive provides the speed ratio of 9 to 1. All standard machines are provided with hand control for this drive with an electric remote control available if desired.

Worthington Pump & Machinery Corp., Harrison, N.J.

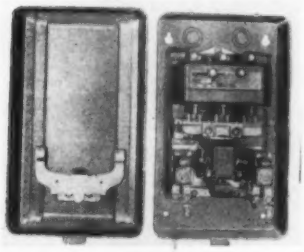


Master and Slave Units in Hydraulic Remote-Control System

The system consists of master and slave units interconnected by two small tubes. Motion applied to the actuating lever of the master is accurately duplicated by the slave lever. It has positive load-carrying ability in both directions because its operation is not dependent upon springs, compressed air, or valves.

The system provides for expansion and contraction of both fluid and metal due to temperature changes. An automatic lock in the slave lever provides irreversibility. The slave unit is also available without this locking feature. Either unit may be mounted stationary or movable and at any position without affecting the operation. Bell cranks, rods, linkage, cables, gears, sprockets and chains are eliminated.

Superdraulic Corp., 14256 Wyoming Ave., Detroit 4, Mich.



Better Arc Extinguishing Features AC Motor Starters

The CY-2 starter combines a strong multi-turn magnetic blowout with twin break contacts. A steel case, enclosing each arc chamber, carries the flux, and is non-carburizing.

The arc is extinguished by applying the effect of the blowout coil concentric with the contact. The steel arc chamber and center stud form the magnetic circuit around each contact. The magnetic field is concentrated in a cone from the steel center stud supporting the upper contact to the steel rim and the lower arc shield surrounding the lower contact. Two different actions occur, changing each half cycle with reversal of the current.

In one current direction the arc is forced to the outer edge of the upper contact, lengthened and rotated. In the other, the arc is rotated and forced to the middle of the upper contact. In each case the magnetic field tends to extinguish the arc, either by lengthening it or confining it.

The most important action is the constant moving of the arc. In its forced rotation, it must continually move from a hot spot to a relatively cool spot. The result is efficient and effective arc interruption.

The top of the arc chamber is closed, thus preventing accumulation of the ionized gases between the wiring terminals. This factor minimizes phase-to-phase failures.

The Clark Controller Co., 1146 East 157th St., Cleveland 10, Ohio

SIDNEY HEAVY DUTY LATHES

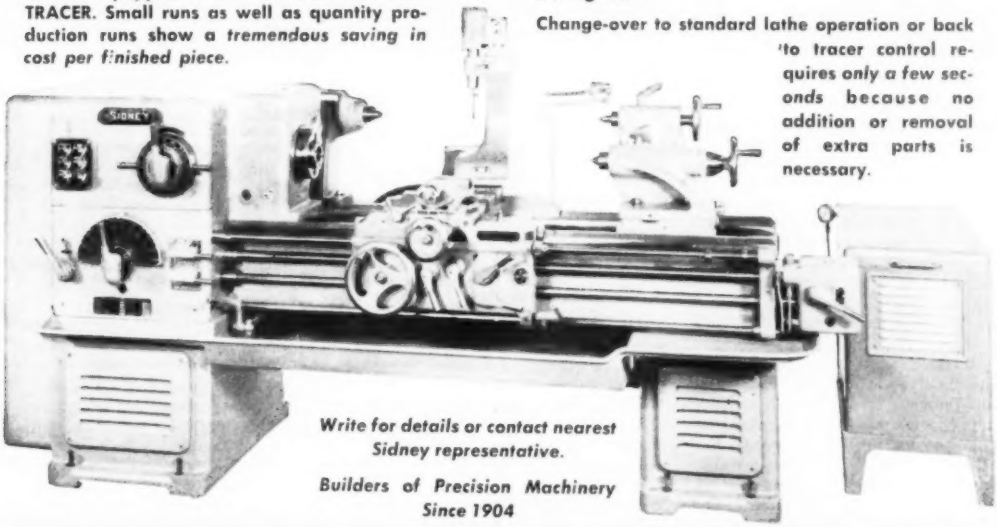
SOLVE YOUR PRODUCTION PROBLEMS

TURN ANY SHAPE.. ANY NUMBER.. FASTER.. MORE ECONOMICALLY

THE variety of shapes and sizes illustrated shows the versatility of the SIDNEY LATHE equipped with the SIDNEY FLUID TRACER. Small runs as well as quantity production runs show a *tremendous saving in cost per finished piece.*

The sensitive tracer head transfers every change in contour of the master piece or template to the cutting tool.

Change-over to standard lathe operation or back to tracer control requires *only a few seconds* because no addition or removal of extra parts is necessary.



Write for details or contact nearest Sidney representative.

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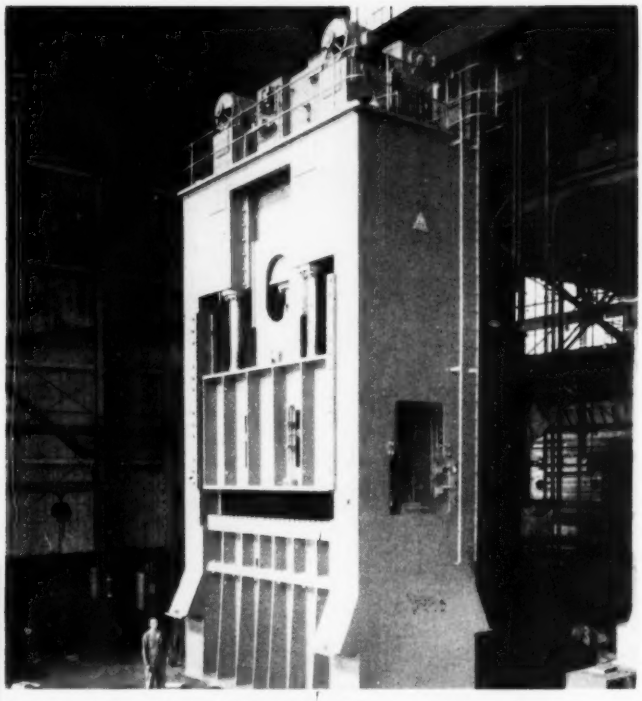


Clearing Hydraulic-Press Permits Quick Change for Many Jobs

Punch-slide capacity	1000 tons
Blankholder slide capacity	500 tons
Max. punch-slide stroke	80 in.
Bed	96x162 in.
Min. shut-height with sub-bolster	20 in.
Min. shut-height	50 in.

Three pressing speeds are available in addition to quick advance and return. Each speed can be used singly with the quick advance and return, or any sequence of speeds can be used to make a total of seven variations of automatic operation. Selection is by means of switches on the control panel. Selector switches also permit choice of double-action operation, single-action with or without the blankholder added, and inching control.

Relative positions of blankholder and inner slide may be adjusted to suit punches of any length without the need for packing or blocking behind short punches. Moveable lugs at each corner, with an arrangement of spaced keyways, permit adjustment by two-in. increments. The same keyways are used with brackets to tie blankholder and slide together for single-action operation. By such use, a slide bolster is avoided.

The press is equipped with three hydropneumatic cushions with independent pressure adjustment up to 150 tons on each cushion. Cushion stroke is 30 in. In anticipation of extremely eccentric loads the punch slide has been extended to obtain additional guiding in the crown.

Two 200-hp motors, mounted in the crown, drive the press. Pressure on each corner of the blankholder can be individually controlled.

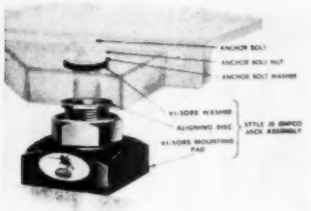
Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.

Machine Leveling Jack Is Vibration Insulated

The Empco jack, Style JS, will support 20 tons and lift 8000 lb. It raises or lowers by turning the adjusting nut to right or left.

The hole through the jack assembly allows clearance for $\frac{3}{4}$-in.-dia anchor bolts. The jack can therefore be located where the equipment can be best supported.

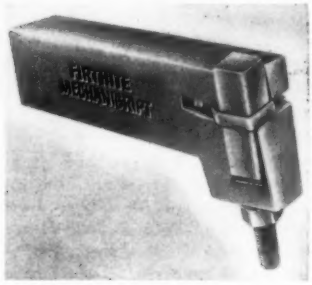
To compensate for uneven floors, the top of the lift screw has a concave spherical radius into which fits the convex bottom face of the aligning disk. This permits sufficient float for leveling while insuring maximum bearing.



Vi-Sorb mounting pads, of vibration-absorbing felt, are available in quarter-inch thicknesses up to 1 in. These pads are cut to fit under the jack base.

The jacks all have $\frac{3}{8}$-in. leveling adjustment and come in three heights. The height of lowest is $1\frac{3}{4}$ in. minimum to $2\frac{1}{8}$ maximum. The next size is 2 to $2\frac{3}{8}$ in. and the third size is 3 to $3\frac{3}{8}$ in. high. These dimensions do not include the mounting pads.

Entreprise Machine Parts Corp., 2731 Jerome Ave., Detroit 12, Mich.



Carbide Tools Redesigned To Eliminate Chip Erosion

Firth Sterling has completely redesigned their carbide-insert Mechanigript tools. They feature open facing of the insert so that chips curl against the carbide. In the former design, the steel shank nearly surrounded the carbide and even though hardened alloy tool steel was used, chip erosion was serious.

The insert can be adjusted by top or bottom screws. This feature makes it practical to use conventional or inverted mounting of the tool and still have easy access for adjusting the carbide insert as required. All styles accommodate carbide inserts made to the shape and size standards established by the Carbide Industry Standardization Committee.

Firth Sterling Steel & Carbide Corp., 3113 Forbes St., P. O. Box 71, Pittsburgh 30, Pa.

FYI FOR YOUR INFORMATION

FREE Catalogs, Booklets, Charts, Calculators

FYI – these initials symbolize information that's important. And there is much of importance in the literature listed here. To get the ones you need, all you do is fill out one coupon for each booklet you wish to order. Indicate in the circle on the coupon the number of one catalog wanted. When you have filled out a card, detach, stamp, and mail. We'll do the rest.

MACHINES AND ATTACHMENTS

1 GRINDING MACHINES — *Cincinnati Grinders Inc., Cincinnati 9, Ohio.* 10-page illustrated specifications catalog containing data sheets on improved 10- and 14-in. plain hydraulic, center-type grinding machines.

2 THREADING MACHINE — *Lees-Bradner Co., Cleveland 11, Ohio.* Illustrated folder giving descriptive data and specifications on versatile, semi-automatic, high-speed threading machine.

3 PISTON GRINDER — *Landis Tool Co., Waynesboro, Pa.* Illustrated pamphlet containing description and capacities of precision grinder for automotive pistons.

4 TAPPING MACHINES — *Avey Drilling Machine Co., Cincinnati 1, Ohio.* 54-page illustrated engineering bulletin 51 furnishes data on a complete line of standard and special drilling and tapping machines and automatic index tables.

5 DIE MILLER — *Cincinnati Milling Machine Co., Cincinnati 9, Ohio.* 20-page illustrated brochure giving design features of tool and die milling machine for use in duplicating shaped contours and intricate detail. Includes applications and specifications.

6 DRILLING MACHINE — *Edlund Machinery Co., Cortland, N. Y.* 8-page folder describing construction and applications of various size drilling and tapping machines.

7 RUBBER-PAD PRESSES — *E. W. Bliss Co., Canton, Ohio.* 4-page bulletin describing single- and double-action presses for rubber-pad forming of aircraft parts.

8 TOOLPOST TURRETS—*Lynn Mfg. Co., Minneapolis, Minn.* 4-page folder describing construction and giving operating data on various sizes of self-indexing toolpost turrets.

TOOLS AND ACCESSORIES

9 TAPPING DATA — *Standard Tool Co., Cleveland, Ohio.* 24-page booklet of tapping data for users of taps and dies. Tables of fits and tolerances and engineering information are included.

10 MILL LUBRICATION — *Rolling Mill Div., E. W. Bliss Co., Salem, Ohio.* 20-page illustrated brochure of lubrication methods recommended for Bliss-built rolling mills.

11 COOLANT-LUBRICANT — *General Aniline & Film Corp., Easton, Pa.* 12-page illustrated booklet containing shop data on emulsifier STH, a new coolant-lubricant for cutting, grinding, drawing, and stamping.

12 AIR TOOLS — *Rotor Tool Co., Cleveland, Ohio.* 44-page illustrated catalog of a complete line of air tools, includes application photos and specifications of air grinders, drills, hammers, scalers etc.

13 BURRING METHOD — *Lea Mfg. Co., Toronto 2, Canada.* 8-page booklet on Lea burring method, giving standard practice for ferrous and non-ferrous metals and full instructions as to use.

14 SINTERED CARBIDE — *Firth Sterling Steel & Carbide Corp., Pittsburgh 30, Pa.* 16-page booklet containing Diecarb grade-selection information and formulae for computing physical requirements of sintered carbides for die sections.

15 GRINDING-WHEEL BOND — *Chicago Wheel & Mfg. Co., Chicago 7, Ill.* 4-page folder of applications and specifications on new "XL" (vitrified silicon carbide) bonded wheels for tungsten-carbide tool grinding.

16 ROUGHNESS TRACING — *Physicists Research Co., Ann Arbor, Mich.* 4-page folder of Profilometer equipment for internal and external roughness measuring by tracing.

17 TAP CONVERSIONS — *Threadwell Tap & Die Co., Greenfield, Mass.* 4-page cross-reference sheet containing complete list of standard taps including style, types and catalog numbers of all American tap manufacturers.

HEAT-TREATING AND WELDING

18 MACHINES FOR HEATING—*Selas Corp. of America, Philadelphia 34, Pa.* 16-page bulletin illustrates and describes production-line machines for metal brazing, selective hardening, heat-forging, tinplate fusion, and normalizing.

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FOR YOUR INFORMATION

19 THERMOMETERS — *The Electric Auto-Lite Co., Instruments and Gauge Div., Toledo 1, Ohio.* 8-page brochure on recording thermometers, dial-indicating thermometers, recording gages, transformer thermometers, etc.

20 HEAT-TREATING — *Diamond Iron Works, Inc., Minneapolis 11, Minn.* 4-page bulletin NX-1 illustrates and describes heaters, torches, forges, tool furnaces, blowers, valves and other equipment.

21 ARC WELDERS — *Miller Electric Mfg. Co., Appelton, Wis.* Describes a complete line of transformer welders for the Heliarc process, with charts, specifications, and recommendations for automatic control panels.

22 PIT FURNACES — *Hevi Duty Electric Co., Milwaukee 1, Wis.* 8-page bulletin describes pit convection furnaces for heat-treating operations from 250 to 1850 F.

PLANT-SERVICE EQUIPMENT

23 MASKING MATERIAL — *The Kay & Ess Co., Dayton, Ohio.* 61-page service manual "Modern Masking Material and Methods for Fabrication and Spray Finishing". Subjects include metal shields and electroformed masks and liquid masking materials and peelable plastic coatings.

24 FLOOR RESURFACING — *Stonehard Co., Philadelphia 23, Pa.* 32-page booklet tells where to look for and how to correct bad floors. Materials for resurfacing both wood and concrete floors are covered.

25 MOBILE LADDERS — *Ballymore Co., Wayne, Pa.* 6-page catalog describes all-steel mobile ladders with from 1 to 8 steps that have safety feature to prevent rolling.

26 BARREL FINISHING — *Minnesota Mining and Mfg. Co., St. Paul, Minn.* 12-page booklet tells what barrel finishing is, who can use it, and what advantages it offers.

27 TOOL-CRIB CONTROL — *Remington Rand Inc., New York 10, N. Y.* 6-page folder tells of a three-way control of tools, dies, and jigs using Kolect-A-Matic and Kardex systems.

28 ROLLER CONVEYORS — *The E. W. Buschmann Co., Cincinnati 32, Ohio.* 16-page catalog 60 shows a wide variety of conveyors together with selection data and diagrams.

29 TRAVELOADER — *Lull Mfg. Co., Minneapolis 6, Minn.* 12-page bulletin features many uses of this fork truck with double platforms. Includes description of many attachments.

30 ROTARY FILE — *Ferris Business Equipment, Inc., Stratford, Conn.* 4-page bulletin describes a cabinet for card filing that does away with belts, punch cards, slots, rods, or any fastening device.

31 SPRAY FINISHING — *Binks Mfg. Co., Chicago 12, Ill.* 6-page folder outlines a five-step program for applying DO finishes and coatings.

PARTS AND MATERIALS

32 CONDUIT FITTINGS — *The Thomas & Betts Co., Inc., Elizabeth 1, N. J.* 64-page catalog on electrical conduit and cable fittings illustrates, describes, and specifies such parts as bushings, couplings, locknuts, and elbows.

33 PERFORATED METALS — *Erdle Perforating Co., Inc., Rochester 11, N. Y.* 26-page catalog describes and gives specifications on many types of perforated metals.

34 SOLDER — *Federated Metals Div., American Smelting and Refining Co., New York, N. Y.* 36-page booklet on the nature, properties, and uses of solder.

35 CARBON BRUSHES — *General Electric, Schenectady 5, N. Y.* 28-page bulletin describes and illustrates the fundamental considerations given to the design, application, and manufacture of carbon brushes.

36 STAINLESS PIPE — *The Carpenter Steel Co., Alloy Tube Div., Union, N. J.* 5 data sheets show the advantages of lightweight Schedule 5 stainless-steel pipe.

37 PRECISION BALLS — *Industrial Tectonics Inc., Ann Arbor, Mich.* 4-page bulletin lists standard and special balls available in cemented carbides, synthetic sapphire, steels, ceramics, plastics, and other materials.

38 VIBRATION-FATIGUE TESTERS — *All American Tool and Mfg. Co., Chicago 14, Ill.* 6-page folder gives applications of these testers and illustrates and describes them.

39 LOCKNUTS — *Townsend Co., Chicago 39, Ill.* 4-page bulletin covers standard Tufflok hex nuts, and Nylok locknuts. Includes specifications.

40 PRESSURE REGULATOR — *Air Associates Inc., Teterboro, N. J.* 4-page bulletin gives information on a regulator for controlling the pressure in hydraulic systems. Includes drawings and specifications.

41 SELF-TAPPING SCREWS — *Parker-Kalon Corp., New York 14, N. Y.* 24-page manual includes self-tapping-screw selection, application data, recommended hole sizes, and drill-size numbers.

42 ELECTRIC MOTORS — *Allis-Chalmers, Milwaukee, Wis.* 6-page folder describes construction and ratings of its totally enclosed, fan-cooled motors with tube air-to-air heat exchangers.

43 CHERRY RIVETS — *Cherry Rivet Co., Los Angeles 13, Calif.* 8-page catalog lists many applications of Cherry rivets and describes and gives specifications on standard rivets and guns.

44 BLACKENING STEEL — *The Mitchell-Bradford Chemical Co., Stratford, Conn.* 4-page bulletin gives the advantages of the Black Magic process for putting a black-oxide finish on steel and iron with one bath.

45 STAMPINGS — *WLS Stamping Co., Cleveland 4, Ohio.* 4-page bulletin illustrates and describes stampings made by the Speedtool method, which eliminates expensive dies and fixtures.

46 DIE STEELS — *Heppenstall Co., Pittsburgh 1, Pa.* 4-page bulletin describes a new alloy hot-working die steel for forging presses and upsetters.

47 JIC PNEUMATIC STANDARDS — *Miller Motor Co., Chicago 13, Ill.* 12-page bulletin gives the recent standards, with sample circuit, glossary of terms, and two pages of standard symbols. Comparison shows how the company's cylinders meet the specifications.

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high boring costs make you blue?

LET THE MAN WITH HOLES IN HIS HEAD LOWER THEM FOR YOU

Every Madison cutter, and bar, no matter what its size, is designed to do your boring operations faster at lower cost. With Madison cutters and bars you never get those high-boring-cost-blues.

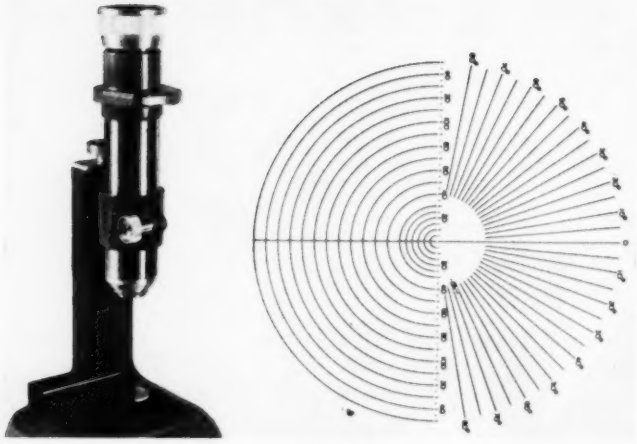
Madison *cutters* range in diameter from 5/8" to any desired size. Madison *bars* range from 2 1/2" to fourteen feet in length . . . or longer. The secret of Madison's ability to cut costs is Madison's exclusive cutter and bar design. First, there is Madison's two bladed cutter. It provides generous chip clearance . . . permits faster cutting without overheating. Second, is Madison's exclusive float design. Cutters float in Madison bars, special floating tool holders are never needed . . . both edges of the cutter take an equal bite. That means more holes per cutter, longer cutter life with fewer regrinds. You get these features, plus many other Madison advantages, when you ask the "Men With Holes in Their Heads" to cut your boring costs. Write today. A brief letter will do.

Write for the information filled Madison catalog: It is yours for the asking.

Tools for rough boring; finish boring; combination rough and finish boring, multiple cutting, bottoming; and other special tools.

MADISON MANUFACTURING CO.

DEPT. AM **MUSKEGON, MICHIGAN**



Cutter-Grinder Microscope Checks Radii, Forms, and Angles

The P.G. microscope is used for engraving tools, small twist drills, and similar work.

It consists of a 15X microscope with detachable reticle. The tube is mounted on a vertical slide for focusing the workpiece.

A simple V-shaped workrest supports the cutters. Special reticles can be made to individual requirements. Both eyepiece and reticle are interchangeable to vary the total magnification. Illustration shows reticle for engraving cutters.

J. Arthur Peakin & Son, 150-28 Hillside Avenue, Jamaica 2, N. Y.

Magnetic-Base Holder for Indicators has 100-lb Pull

The No. 150 duplex indicator holder attaches to flat or curved surfaces. It is equipped with a fingertip release for positioning the holder without jarring the indicator. The set includes accessories for accommodating all stem, hole, and lug-back indicators.

The holder is constructed of tough molded plastic. Steel parallel ribs, 2¼ x ¼ x ¼ in, provide the magnetic contact surface.

Enco Mfg. Co., 4522 W. Fullerton Ave., Chicago 39, Ill.

GE Quality-Control Device Aids Continuous-Sampling Method

A given number of consecutive acceptable units is established by 100% inspection. This clearance number, and the percentage number to be used for sampling, are determined by the desired average outgoing quality level (AOQL), selected from a set of curves supplied with the equipment.

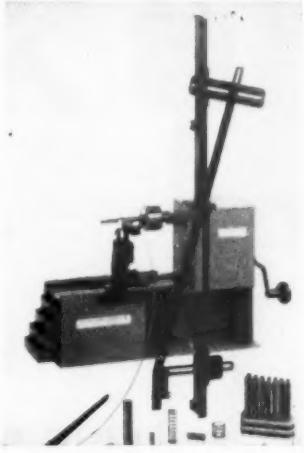
When the clearance number is reached, sampling begins. The prescribed percentage of units is inspected until an unacceptable unit is found. This defective piece is replaced by a good unit, and the 100% inspection is followed again until the clearance is reached, at which time sampling resumes.

General Electric has developed a monitor to keep track of this sampling procedure. The inspector pushes one of the two buttons—labeled "accept" and "reject"—after each inspection. He then follows the directions shown by one of two indicating lights; he inspects every unit while the red light is on, and samples while the white light is on.

The monitor works this way: An electric counter, set to any predetermined number from 1 to 400, automatically keeps track of the clearance number. When the counter reaches the set number, contact is broken, and the white sampling light goes on, indicating that the predetermined number of acceptable units has been inspected, and that sampling can resume. Percentage inspection or sampling may vary from 1 to 50% depending on the desired AOQL.

The monitor requires 110 v and has a maximum counting speed of 500 units per min.

General Electric, Schenectady, N. Y.



Carlson Spring Coiler

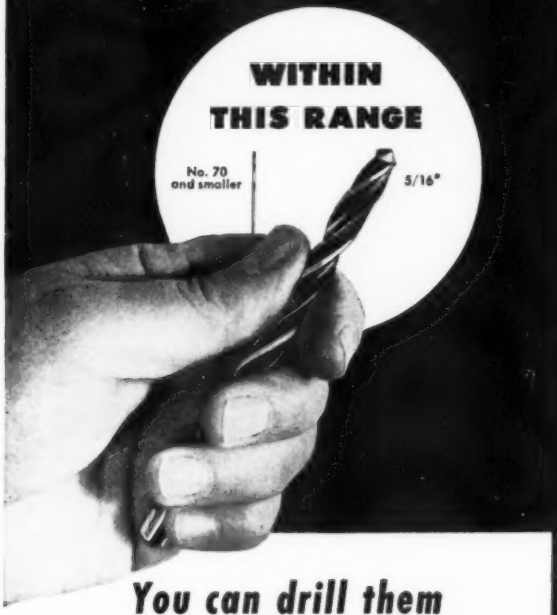
Hand-operated spring coiler makes large compression, extension, and torsion springs. Known as the No. 2, it has twice the capacity of the earlier model.

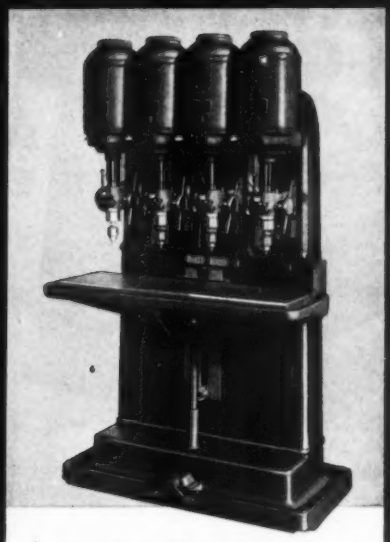
It is especially useful for making experimental or sample springs and for short production runs up to 500 pieces. The setup time is less than 5 min and production is up to 300 springs per hr.

Compression springs can be wound up to 8 in. long with any number of coils up to 30, to any pitch up to 1 in., and the end coils are closed or squared automatically on both ends. Extension and torsion springs can be wound tight or loose, up to 8 in. long, either left or right hand, up to 150 coils, with extended arms on both ends up to 5 in. long. Outside diameters up to 2 in. and wire diameters from 0.41 to 0.156 in. can be coiled. An arbor rack with 29 arbors, 7 coiling points, and a wire cutter are included. Net weight is 70 lb.

The Carlson Co., 277 Broadway, New York 7, N. Y.

If you drill Precision Holes





- Bench or Floor Types
- One to Six Spindles
- Speeds up to 10,800 RPM
- 12 or 20 Inch Swing
- Hand or Hydraulic Feed
- Tapping by Friction Tapping Attachment

You can drill them Better, Faster and at LESS COST with

LELAND-GIFFORD

NO. 1 LMS MOTOR SPINDLE

Drilling Machines

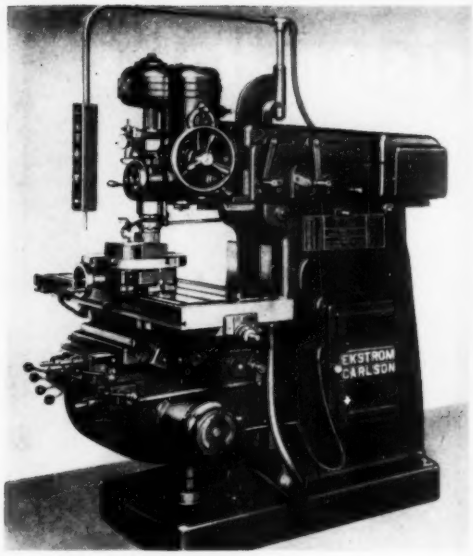
Precision holes cost less when you use the right machine for the job. For small holes—from the smallest up to 5/16" — the *right* machine is the Leland-Gifford No. 1 LMS Motor Spindle Drilling Machine. Available adapted precisely to your needs. Super sensitive yet ruggedly built to maintain accuracy and to keep on producing precision work with ease and accuracy year after year. Write for complete information.

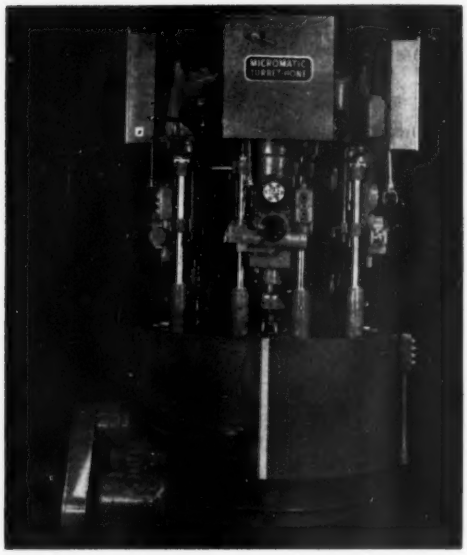
PRODUCTION MEN
Get This Handy Slide Rule

A valuable aid in figuring costs and setting production schedules. Quickly gives time required to drill holes of any size and depth in any material. It's free. Write the nearest office.

LELAND-GIFFORD
Drilling Machines
WORCESTER 1, MASSACHUSETTS, U.S.A.

CHICAGO 8, 565 W. Washington Blvd.; DETROIT 26, 1533 Dime Bank Bldg.; CLEVELAND 1, P. O. Box 5547; NEWARK 2, Industrial Office Bldg.; ROCHESTER 10, P. O. Box 67; LOS ANGELES 14, 724 So. Spring St.





Tilting Table, Head Featured On Ekstrom Carlson Miller

Longitudinal table movement	29 in.
Cross table movement	13 in.
Vertical (knee) movement	16 in.
Table feeds: long.	8, from ⅜ to 12¾ ipm
cross	same as longitudinal
vertical	8, from ⅛ to 5¼ ipm
Spindle speeds	12, from 36 to 1240 rpm
Spindle feeds	0.003, 0.005, 0.008 ipr
Vertical spindle travel	8 in.

The EC No. 5V has five features: a ram head; a swivel head; a sliding spindle; a swivel table; and a four-way power-feed mechanism.

The machine consists of a base and column casting, a horizontally adjustable ram mounted on the column and supporting a swivel sliding spindle head and spindle drive, and a tilting worktable mounted on a saddle-and-knee assembly. Longitudinal, cross, and vertical table movements are power driven.

The operator moves the spindle head by loosening two bolts on the ram which carries the head to its working position. With simple adjustment of tilting table and head, the operator can mill flat, vertical, horizontal, or angle surfaces.

The spindle is provided with a positive-action lock with a large bearing surface which may be tightened without distortion of the head. The flange on the head casting is graduated in degrees with the zero position located when the head is in the true vertical position. The head is tilted by means of a suitable worm and worm gear, located within the ram and operated by a removeable handcrank. Vertical movement of the spindle is by either hand or power feed. The spindlehead tilts 45° to either side.

The table tilts front and back on a horizontal axis a total of 60°. The tilting is accomplished by a worm-gear quadrant mounted on the tilting member and meshing with a worm.

The knee has both hand-operated and power feeds, all controls of which are located in front.

Capacity of the miller: vertical throat clearance, 19½ in.; max. distance spindle to column, 30 in.; minimum, 8 in.

Ekstrom, Carlson & Co., Rockford, Illinois

Sodium-Salt Cutting Fluid Forms Adhesive Film

The active portion of Cut Cool is the sodium salt of a hydrocarbon-sulfamido-acetic acid. Oily, it gives a film that has adhesion to metals approaching a bond, and which is not affected by hydrogen.

Other properties claimed for the chemical are: emulsifiable to infinity, and not affected by hardness in water.

The tightly adhering film makes the solution good for deep-drawing operations. It is claimed to have a high rate of heat transfer and to form a very thin film on cutting tools, thus reducing dragout losses.

Organic Products Co., Irving, Tex.

Honing Machines for Accurate Work on Short-Length Bores

These machines are claimed to hold precise tolerances in short-length bores up to 4 in. in dia and less than 2½ in. in length. They are available in single-spindle units or four- or six-spindle models mounted on a rotating base. Known as Turret-Hones, the multi-spindle units rotate at a constant 2 rpm. The operator stands in one location to load and unload work.

One motor, mounted on the spindle housing, powers both rotation and reciprocation. The mechanical stroke is adjustable up to 2 in. in length. Expansion of the tool may be adjusted manually or with the hydraulically controlled Microdial.

For rigidity and maintenance of alignment, the work fixture is carried by a saddle supported by the same bars as the head. This rigidity makes it possible to hold squareness between the bore and the face of the part. The saddle has a 6-in. fallaway from the honing to the loading position.

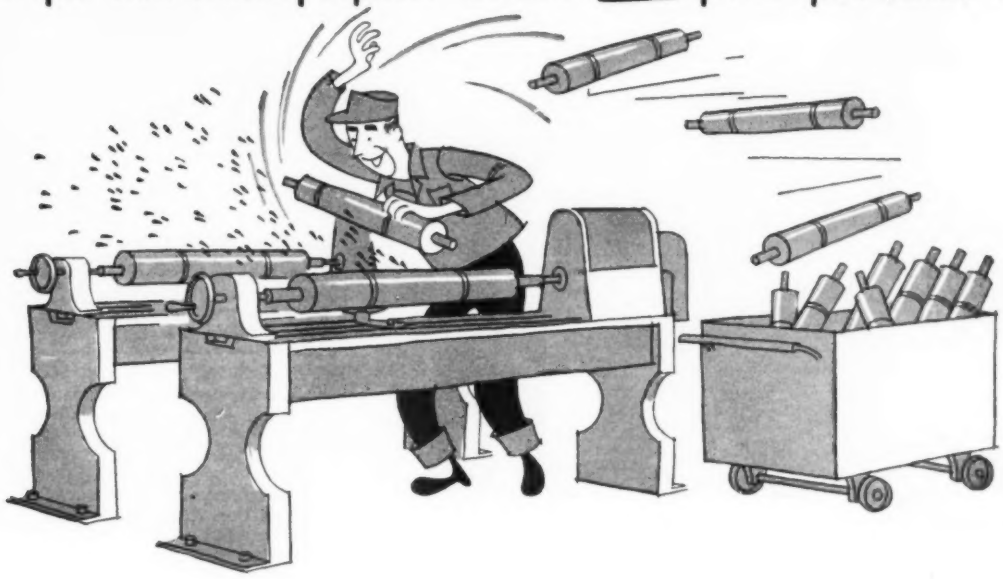
In single-spindle machines, no hydraulic pumps are used. The fixture saddle is raised by an air cylinder and the Microdial is powered by an air-operated intensifying converter.

The machines are designed in accordance with JIC standards.

On the multi-spindle machines, the cycle is as follows: As the fixture leaves the loading position a hydraulic cylinder lifts it into the honing position. The last increment of

MAGNESIUM

high machining speed means more pieces per hour!



When it comes to machinability, you can't beat magnesium! Generally, the maximum rate of machining speed is limited only by the maximum speed obtainable on modern machine tools. This, of course, means more pieces per hour and a sharp cut in production costs. One source reported a 50% reduction in machining costs over the metal previously used.

Another outstanding machining characteristic of magnesium alloys is their ability to take an extremely fine finish. Surface smoothness readings of three to five micro-inches have been reported for finish-turned magnesium. Finish-grinding operations required on other metals usually can be eliminated.

Cutting tools designed for steel or brass may be used, but to take full advantage of magnesium's machinability, tool design should be slightly modified. It is suggested that relief angles be increased and clearance angles made larger to provide greater chip space.

Dow has over 30 years of experience in magnesium—a call to your nearest Dow sales office will put this knowledge at your disposal.

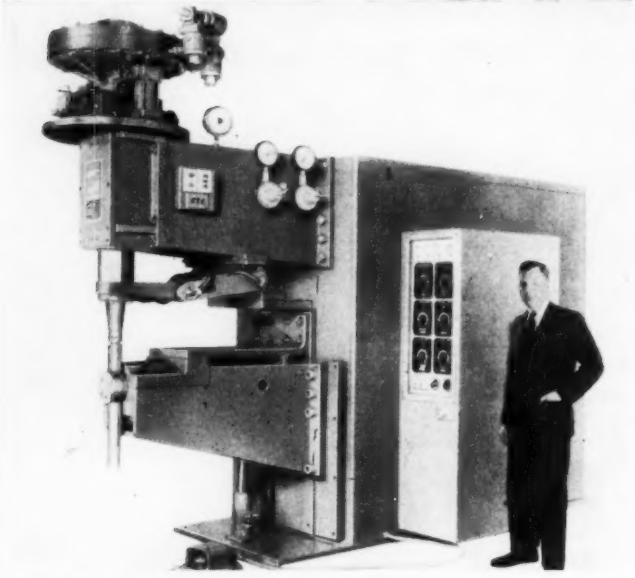
THE DOW CHEMICAL COMPANY

Magnesium Department • Midland, Michigan

New York • Boston • Philadelphia • Washington • Atlanta • Cleveland • Detroit
Chicago • St. Louis • Houston • San Francisco • Los Angeles • Seattle
Dow Chemical of Canada, Limited, Toronto, Canada

travel of the saddle operates a limit switch that starts the spindle rotating and reciprocating. At the same time the Microdial expands the tool at a controlled, positive rate. If the part is to be clamped, the tool expands to rough-bore size and locates the part. When the bore is honed to the desired size, the Microsize control stops the expansion of the tool, cycles a runout period, collapses the tool, stops the spindle, and drops away the fixture. When the unit enters the loading position the operator unloads the fixture, slips another part in and the cycle is repeated.

Micromatic Hone Corp., Detroit, Mich.



Sciaky Spotwelder Exerts Electrode Force up to 23,000 lb

With an electrode force adjustable up to 23,000 lb and a rating of only 400 kva, this machine is capable of exceeding the rigid requirements of the Air Force-Navy Aeronautical Specifications AN-W-30 (Mil-6860) and AN-W-3C (Mil-6858). Up to two thicknesses of ¼-in. aluminum alloy can be spotwelded.

A rapid rate of rise of forging pressure was achieved through the use of a frictionless diaphragm pneumatic-pressure system.

A "tailor-made" wave shape, adjustable to suit any given application, was obtained by the three-phase, Modu-Wave system. This enables current, timing, and pressure sequences to be closely controlled.

The current conductance efficiency of the secondary circuit was improved by the adaptation of solid electrolytic copper bars with sliding silver contacts at each terminal. The bars transmit current from the transformer to the movable electrode.

Peak short-circuit tip-to-tip current is 225,000 secondary amperes, corresponding to a primary demand of 1700 kva—which is only 1/3 the demand of a single-phase machine producing the same secondary amperage. Power factor is 85% min.

Sciaky Bros., Inc., Chicago, Ill.

Carbide-Conservation Kit For Lapping Tools

Contained in the kit are a 6-in.-dia. formica lapping wheel, a Dymo applicator gun modified for charging the wheel and 5 grams of Elgin Dymo diamond compound, sufficient for lapping 500 average, single-point carbide-tipped tools.

Diamond lapping is claimed to increase the life of carbide-tipped tools from 2 to 10 times. The lapped cutting edges hold up longer and less carbide is removed in regrinding.

Industrial Products Div., Elgin National Watch Co., Elgin, Ill.

Swiss Milling Machine

Rectangular-table surface	17 23/32x7 7/8 in.
Spindle speeds:	
Horiz. head	130, 200, 380, 595, 1460 rpm
Vertical head	160, 250, 470, 730, 1150, 1800 rpm
Horiz. table stroke	6.7 in.
Vertical table stroke	6 in.
Cutterhead stroke	4 27/32 in.
Automatic table feed	3/8 to 9 ipm

This machine is identified as the Schaublin Type SV 12. It has many attachments that make it interchangeable as either a toolroom or production model. In addition, many attachments are interchangeable with the well-known Schaublin lathe.

Some of these are: vertical head, dividing headstock, swivel-type parallel vise, inclinable rectangular table, semicircular table, and automatic feed.

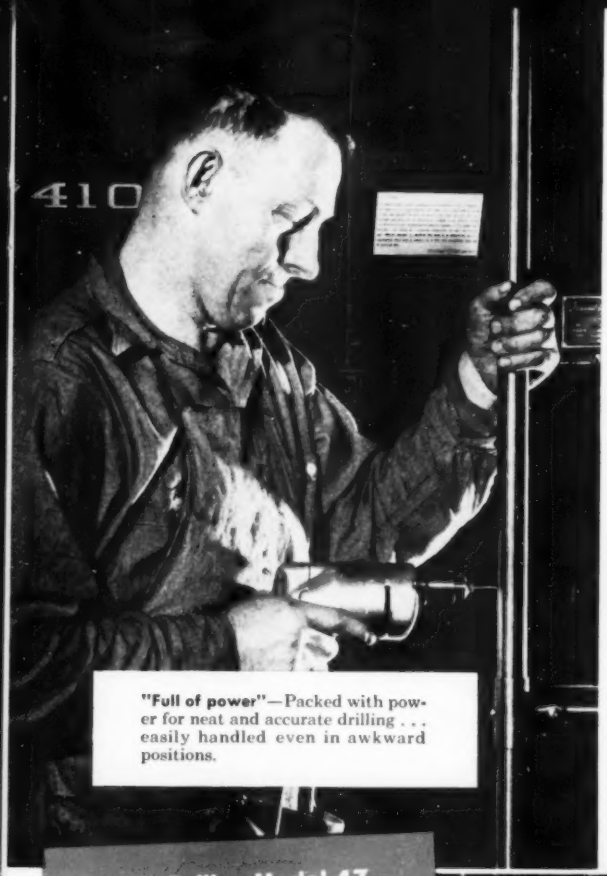
The standard machine consists of the frame, horizontal cutterhead, angle bracket with saddle, tray for coolant, cabinet stand, motor, and controls. It is priced at $2250.

Carl Hirschmann Co., 30 Park Ave., Manhasset, N. Y.

Manco Steel-Strap Cutter

This cutter, called the Model 345, cuts steel strapping measuring ¾ by .050 in. and can get under tightly bound strap. It measures 9 in. in length and weighs ¾ lb. The forged blade cuts by a shearing action; and, according to the manufacturer, the tool may be easily operated by one hand.

Manco Mfg. Co., Bradley, Ill.



"Full of power"—Packed with power for neat and accurate drilling . . . easily handled even in awkward positions.

"SKIL Drills give us the longest service"

says **CHECKER CAB MANUFACTURING CORPORATION**
Kalamazoo, Michigan

"Waiting for a bus" is exactly what many municipal transportation companies are doing . . . so Checker Cab Manufacturing Corporation speeds the production of these buses with fast, dependable SKIL Drills. They're on the job in every step of production . . . working every day and all day . . . operating with accuracy, speed and trouble-free performance. "We've got almost 200 SKIL Drills at work here," they say at Checker Cab Manufacturing Corporation. "We've tried other brand drills but for the last four years we have been using SKIL Drills. We know SKIL Drills have the highest dependability and the longest service life."

SKIL Drills—Model 47
—are on the job . . . giving the same fast, dependable service you want for your production and maintenance work.

SKIL Drill—Model 47
Compact heavy duty ¼" drill. Capacity in steel: 0" to ¼"; in hardwood: 0" to ½". No-load speed: 1800 r.p.m. standard. Overall length: 7¼". Weight: 3½ lbs.

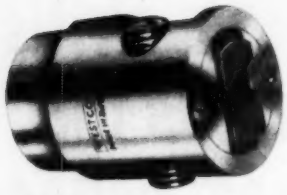
"Easy as pointing a finger"—Large panels of sheet steel are easily drilled for the anchor rivets.

"Convenient to use in any position"—This light weight drill doesn't tire the operator as he installs overhead trim in the interior of the bus.

Call your ***SKIL*** *Distributor for complete information*

SKIL
PORTABLE TOOLS

SKIL Products are made only by SKILSAW, Inc.
5033 Elston Avenue, Chicago 30, Ill.
Skilsaw Factory Branches in Principal Cities
In Canada: Skiltools, Ltd., 3601 Dundas Street West, Toronto, Ont.

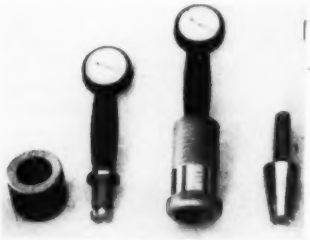


Swedish-Made 2-Jawed Drill Chuck

The chucks are claimed to be: simple in design and construction; easy to operate; accurate; compact, and have a good finish. The upper part of the chuck housing is reinforced with a steel collar. A T-handled operating wrench is supplied with each chuck.

It is available in three sizes, as follows: No. 119-3, capacity 0 to ½ in.; No. 119-5, capacity 0 to ¾ in.; No. 119-6, capacity 0 to 1 in. Morse-taper arbors for the chucks are available, also replacement parts.

Westcott Chuck Co., Inc., P.O. Drawer 270, Oneida, N. Y.



Taper Comparator Can Check 16° Angle to ±18 sec

Tapered holes can be checked accurately and quickly with these comparators. Production checking of taper parts has been done almost exclusively heretofore by the feel method with the use of taper plug and ring gages—a method that is not as accurate.

The Tacomp uses two contact lines on the taper; established by the two disks that make up a gage set. Their distance apart as compared to a master is determined on an indicator mounted in the handle of the unit. This method is said to result in even greater accuracy than that normally gotten by sine-bar check, especially in the case of short tapers. This is due to the fact that the indicator records the difference in length of the side adjacent to the angle (distance between gage disks) whereas a sine-bar check is a comparison of the short or opposite side.

The gage members are specially designed for male or female tapers of a given dia and length. The gage sets are mounted into a unit by inserting, adjusting zero on the indicator while entered into a master and tightening the lockscrews.

Each gage set is stamped with the basic angle for which it is designed as well as a constant converting thousandths or ten thousandths as shown on the indicator into angular measurement.

Gage sets can also be designed for checking position of taper or diameter, depth of holes, shoulders, steps, slots, squareness of internal shoulders and other dimensions.

The Dow Mechanical Corp., Thompsonville, Conn.

Damage to Double-End Cutters Prevented by Cushion in Chuck

This collet chuck is claimed to have great gripping power. It is said the tool can not be loosened even during deep cuts on tough alloy steels. The locking nut has small external dimensions giving greater visibility to the work.

A rubber cushion is set into an upper recess in the chuck body, preventing damage to doubleend milling cutters and all long tools. The part of the collet inside the chuck body is extra long to give good guidance; and for greater rigidity, the projecting end is short.

The chucks are of Swedish design and manufacture and are available in sizes from ⅛ to 1½ in.

The Eric S. Johnson Co., 230 E. Ohio St., Chicago 11, Ill.

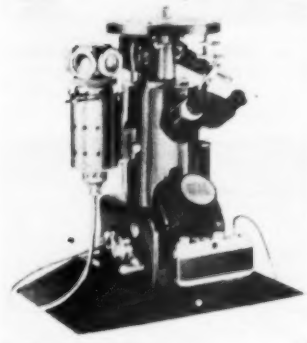
Dies Speedily Changed on Automatic Roll Marker

Dies can be easily changed on this roll marker for screw machines— it is only necessary to remove two Allen cap screws. When these are removed, the keyed die shaft and starting-point adjustment screw assembly come out in one unit, releasing the die. Another die is then held in position, the shaft slid through the die and holder and the cap screws inserted and tightened.

As before, all parts including bearings are standard, the latter being available from any jobber. Use of ball bearings eliminates the need for boring, reaming, and pressing in of solid bushings.

For shops handling a limited number of different parts, solid roll dies are recommended. For plants handling many different parts, interchangeable roll holders with a font of replaceable type are available. Various diameters of solid or type rolls are interchangeable in the same marker.

New Method Steel Stamps, Inc., 147 Jos. Campau, Detroit 7, Mich.



Griswold Metallograph For Structural Analysis

A large assortment of objective, ocular, and projective lenses are provided. These are parfocal and parcentered, coated on all air-glass surfaces and corrected for infinity.

The OPL metallograph is compact, occupying a table space of less than 12x12 in. Over-all height is 18 in. The staging table is lifted instantly for lens changing. The lenses can be quickly inserted and removed without centering. No refocusing is necessary.

The operator can observe the sample through binoculars or on a ground-glass screen without changing his position. Photos can be taken on 35-mm. roll film by swinging the image from the ground glass to the camera. Accessories are available for special uses.

F. T. Griswold Mfg. Co., Wayne, Pa.

Tool Steel Topics

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

Lehigh H Shear Blades To Blame for Idle Time

The other day a Bethlehem salesman was surprised to find one of his good customers, a shop boss, in a somewhat hostile mood for no apparent reason. "You've got me in real trouble," the boss said. "Remember that Lehigh H steel you suggested we use for shear blades?"

"Why, yes, I do," admitted the salesman.

"Well, come with me," replied the customer. "I want to show you something."

They walked out in the shop where the shear blades were used to cut steel and brass strip. So far as the Bethlehem man could see, the blades seemed to be working fine. He looked at the customer and this time he detected a twinkle in his eye.

Leisure for Tool Grinder

"See that fellow over there?" And the customer pointed to a workman who was reading the morning paper. "That's our tool grinder, and he's a good one, too. He used to spend most of his time grinding blades. But those blades we made out of Lehigh H just seem to last forever. And every morning I have to rack my brains to find something else for him to do!"

The boss had a good laugh. Then he gave the salesman an order for more Lehigh H tool steel. He could afford to have his tool grinder idle much of the time. His shearing costs had been sliced in half.

High-carbon, high-chromium Lehigh H is just what the experienced toolmaker needs wherever maximum wear and minimum distortion are important. It's air-hardening, safe for intricate dies, thin sections, sharp corners. And it's deep-hardening, with high compressive strength for heavy-duty tools and dies.

Ten Times More Necktie Clasps with Hobbed Molds of Duramold A

Here's another enthusiastic report on Duramold A, our 5 per cent chromium, air-hardening hobbing steel. Hobbed for zinc die castings, this special-purpose steel has upped the life of molds by at least 1000 pct, according to Peerless Engineering Co., Inc., South Gate, Calif. In the casting of novelty necktie clasps, the die sets of Duramold A were examined at a time when previous molds had to be discarded. The Duramold A cavities showed no evidence of checking or sinking; and the surface finish appeared to have actually improved with use.

M. T. Derby, chief tool engineer for Peerless, sums it up:

"We like Duramold A because it's easy to hob. In making multiple cavities we get good detail and accuracy with fewer machine-hours. For most of our work we need a steel that gives us a high polish in the cavities with a high hardness that will stand up under zinc-injection molding at high pressures and temperatures. We've found Duramold A to have good core strength, it doesn't sink readily, and we can expect to get long runs with very little maintenance."

Whether used for die-casting or plastic-molding Duramold A is a real improvement over hard-to-hob steels. Its 5 pct chromium content provides plenty of wear-resistance and core strength . . .

Duramold A is hobbed in one push in a 300-ton press by the master hob shown at top. Eight necktie clasps are cast at one time, the molten zinc being injected at 800 F and 2000 psi; mold temperatures reach about 500 F.

and its air-hardening properties hold distortion to a minimum during heat-treatment.

Its typical analysis:

C	Mn	Si	Cr	Mo
0.07 max	0.40	0.20	4.50	0.45

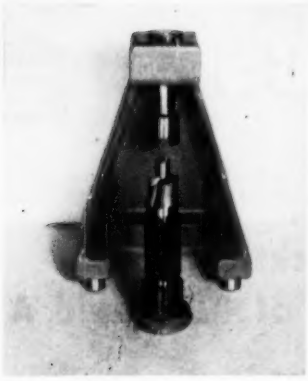
Booklet 271 will help you select the right tool steel — for hobbed molds, machine-cut molds, or master hobs. Address your request to our Publications Department, Room 1041, Bethlehem, Pa.

Our Tool Steel Engineer Says:

Poor tool design can cause cracking in heat-treatment

Proper attention paid to tool design can often prevent the cracking of tools during heat-treatment. Too often the heat-treater is asked to harden tools which cannot be quenched properly. One frequent design fault is a tool having a heavy section adjacent to a light section. Unnecessarily sharp corners is another design fault that can cause cracking. Provide fillets wherever sharp corners are not essential.

Bethlehem ULTRASONIC TESTED **Tool Steel**



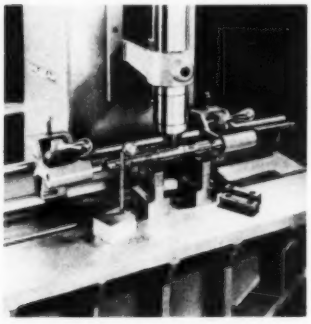
Presetting Gages Save 80% in Setup Time

These flush-pin and height gages are for multiple-spindle and transfer machines. They are used for presetting drills, taps, reamers, counterbores, countersinks, and other cutting tools which have been inserted in adjustable adapters before being placed in machine spindles. They are claimed to reduce setup time as much as 80%.

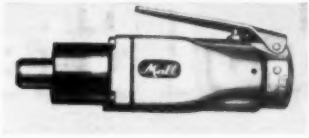
The flush-pin gage is made of cast iron with three hardened jig feet, hardened bushing, and pin. The seven sizes will gage distances up to 14½ in. and may also be used for gaging piece parts.

The height gage is hardened and ground. It is equipped with a quick-lock nut which enables the setup man to adjust and lock the unit on the job. The five sizes gage distances up to 17 in.

Scully-Jones and Co., 1902 S. Rockwell St., Chicago 8, Ill.



GOOSENECK PRESS, (10-ton, type PGRF) straightens small- and medium-size automotive-transmission shafts. Accessories include roller-mounted, spring-loaded work supports to accommodate many parts, movable resistance blocks with replaceable wear plates, special ram nose, and dial indicator with stand. The shaft is loaded between the two centers, the spring support is clamped in place, and the control lever depressed to bring the ram nose down. Stroke is 18 in., daylight 24 in., and the throat 8 in. —*The Oilgear Co., 1563 W. Pierce St., Milwaukee 4, Wis.*

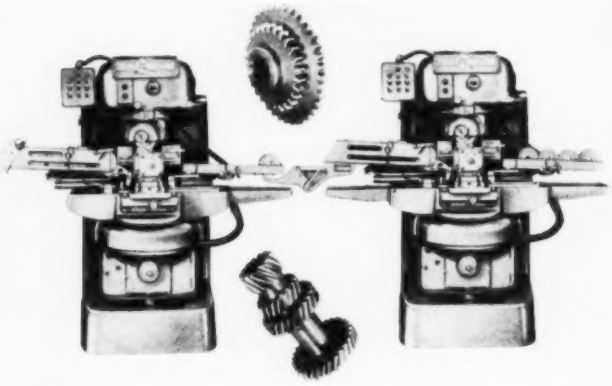


Mall Pneumatic Die Grinder With Arbor Runout to 0.0015 in.

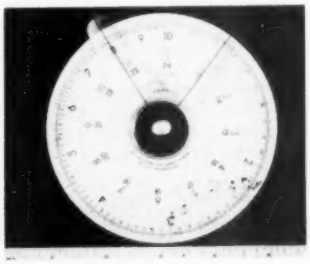
This tool is 4⅝ in. long, 1¼ in. wide and weighs only 12 ounces. A choice of lever or button throttles with a special collet guard allows the operator to hold the tool close to the work. An arbor runout within 0.0015 inch allows accurate work. Eight sizes of Erickson precision collets are available to give a range of shanks from 1/64 to 1/4 in. The collets have extra gripping power for safety at high speeds.

The rotary-vane air motor is cool running and develops 26,000 rpm. Speeds can be stablized by a built-in speed regulator within a limited range for each application. Air exhaust is directed away from the operator, where it cleans and cools the work. Motor is equipped with a new noise silencer that eliminates annoying high-pitched tones. Housing is made of polished aluminum alloy. Price—$65.

Mall Tool Co., 7740 S. Chicago Ave., Chicago 19, Ill.



AUTOMATIC LOADER has been developed which permits the shaving of all gears of a two-, three-, or four-step cluster continuously and automatically by a battery of Red Ring diagonal shaving machines set side by side in line. This arrangement permits full view of the operation by the operator. All handling is done by automatic transfer mechanisms. Each cutting cycle is automatic. The loader has a magazine having gravity feed, an intermediate feeder slide, and an inclined discharge chute. An automatic gage prevents entrance of oversize gears.— *National Broach & Machine Co, 5600 St. Jean Ave., Detroit 13, Mich.*



Time-and-Motion Studies Simplified by Pocket Computer

Computer eliminates separate pencil calculations and slide-rule work for determining manufacturing costs or job status. A time analysis can be converted to monetary factors without intermediate pencil calculations.

The device is a plastic 4-in. circular disk upon which are concentrically superimposed a time scale and log scale. Two movable arms integrate the time clock in terms of manhours, unit or aggregate product cost, job efficiency, and relative proportions.

Willer Sales Co., P. O. Box 10008, International Airport, Los Angeles 45, Calif.

FIRST ORDER OF THE DAY—

PRODUCE!

Today, America's mighty production machine must meet the biggest order in history. It must produce enough to defend freedom and to maintain our economy!

As manufacturers of lubricants—the *one* product indispensable to *all* industry—our part in this tremendous job is to help your machines run at peak capacity . . . provide more continuous production, minimize downtime.

Toward this end, we pledge all our resources—offer you . . .

- A complete line of proved quality oils and greases for all your needs.
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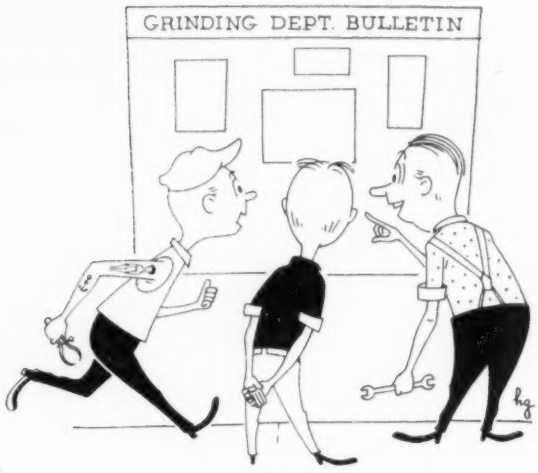
WORLD'S GREATEST LUBRICATION KNOWLEDGE AND ENGINEERING SERVICE

GOOD NEWS for the grinding department



SIMONDS ABRASIVE CO.

Grinding Wheels

Production up! That's the bulletin board's big news... good news that started when Simonds Abrasive Company wheels went to work in the grinding department. Simonds complete line includes wheels accurately specified for top results on *your* jobs . . . grinding wheels, mounted wheels and points, segments and abrasive grain . . . all made under complete quality control by Simonds Abrasive Company, a major manufacturer of grinding wheels for almost 60 years. Write for free data book and your distributor's name.

SIMONDS ABRASIVE CO., PHILADELPHIA 37, PA. BRANCH WAREHOUSES: CHICAGO, DETROIT, BOSTON
DISTRIBUTORS IN PRINCIPAL CITIES

Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N. Y., Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd. Arvida, Que.

ROUND TABLE Discussion

PACK RATS

STRICT WATCH over the company's belongings is just good housekeeping, and unless we are going to condemn or dilute all forms of discipline we cannot turn a blind eye to known petty pilfering. This does not, of course, mean that a man or woman should be fired or dragged before the court for appropriating, say, a small screw or for carrying off a piece of scrap wood for kindling the home fire.

Large numbers of small items, such as screws, small spanners, pieces of copper, brass, etc., are pilfered every day from every workshop and as long as human nature remains what it is, these irregularities will persist.

After a lifetime of experience in the shops I am convinced that it is beyond the wit of man to devise any method which will solve this problem over which "Al" is rightly concerned. At the same time, more "Als" in responsible positions in the shops would tend to put a brake on the pilferers' activities. Too many executives regard this nuisance lightly and too few, themselves, set the correct example. Here, if anywhere, the soundness of the theory of management by example will be vindicated in practice.

In plants where higher management are scrupulously careful not to abuse their trust by using the company's time, labor, or materials for their own personal ends, it will be found that pilfering is of slender proportions. Their good example creates an atmosphere which filters through to the shops and pervades them, a tonic grapevine. It has a beneficial effect on the shop foremen and is not without an influence for good on the men. The power of a good example is the greatest moral weapon in the hands of man today. It is capable of impressing the dullest of minds and can get under the toughest of hides. Setting a good example will change all but the hardened offenders; they are easily spotted and just as easily dealt with.

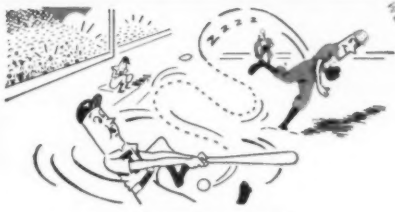
Short of a personal search, I know of no sure way of detecting "lifted" property. In 1914 I was employed in a naval establishment in Britain where personal search was the method adopted. Several thousand hands were employed and the search method worked as follows: All employees

TAPPING TECHNIQUES No. 18

The game was tied up four to four,
The Toolville crowd was getting sore.
Their favorite pitcher with the "tapered shank"
Gave up three "passes" . . . Brother, how he stank!

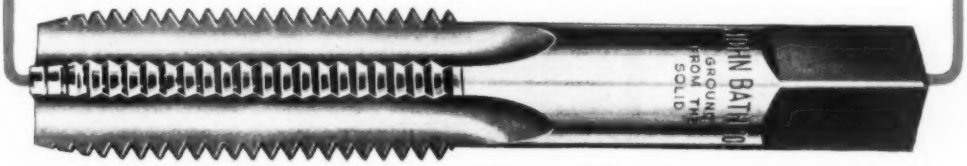
He was as wild, as wild could be.
Had no control or accuracy.
'Til he "grooved one in" . . . then came a "wham" . . .
And the Bathville boys had a nice "grand slam".

JOHN BATH CO. INC. WORCESTER MASS.



Then came the test for the Bathville team,
And every player was "on the beam".
A perfect "hook" helped every "pitch"
To retire the side "without a hitch".

Bath Taps are hardened veterans, all.
In the field they have plenty "on the ball".
They're always ground after being treated —
To give you a season . . . undefeated!



INSIST ON BATH TAPS . . . PROFIT BY THEIR PLUS-PERFORMANCE

You're always "ahead of the game" with Bath ground thread taps . . . because you can depend on controlled uniformity. Every Bath Tap is hardened to full high heat, imparting to the blank the proper hardness and steel structure. No overheating of thin, delicate threads . . . no danger of thread softness by underheating. The finest heat treating equipment allows perfect control of the correct degree of hardness *before the threads are ground.* The shanks, major and thread diameters and chamfers are ground on centers so that Bath Taps are always concentric.

These extra manufacturing features plus rigid quality-control, combine to prove our claims for greater production and better workmanship for Bath Tap users. Let us help with your threading problems.

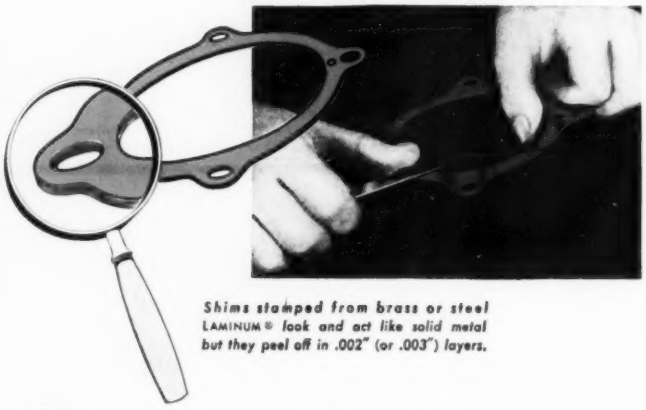
PLUG AND RING THREAD GAGES • GROUND THREAD TAPS • INTERNAL MICROMETERS

JOHN BATH CO. INCORPORATED

22 Grafton St., Worcester, Mass.

LAMINATED SHIMS

SIMPLY PEEL FOR ADJUSTMENT



Shims stamped from brass or steel LAMINUM® *look and act like solid metal but they peel off in .002" (or .003") layers.*

Provide great accuracy yet allow easy machining tolerances

No counting

Speed production by simplifying your spacing adjustments

No stacking

Reduce lathe time; no standby machine required during assembly

No miking

Adjustments right at the job by peeling laminations with a penknife

Precision cut to your exact specifications, with careful quality control

URGENT! Save production time! Shims are more important now than ever!
SEND TODAY for our Engineering Data File

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LAMINATED SHIM COMPANY, Inc.
3108 UNION STREET GLENBROOK, CONN.

CUSTOM SHIMS STAMPINGS SHIM STOCK

entered and left by one main gate and as the men filed out, mid-day and evening, three guards equally spaced across the road, stood on duty. Their outstretched hands could touch and each outer guard could touch the boundary wall. The men file out past the guards who touched, on the shoulder, any man they wanted searched. When touched, the man stepped to a room where other guards carried out a fairly close search. This method is reputed to keep pilfering within very narrow limits. This "police" method was not 100% efficient. With a dense throng of men swaying past the guards, it was a comparatively simple matter to take out small parts with the help of an accomplice. It worked this way: The two men concerned kept side by side, close together, one held the "grab" in his hand, the hand next to his fellow conspirator, if he was "touched" he simply passed the "grab" to his friend and proceeded to the search room to be examined and, of course, pronounced OK.

C. D. Mackinon
Airdrie, Lanarkshire, Scotland

•

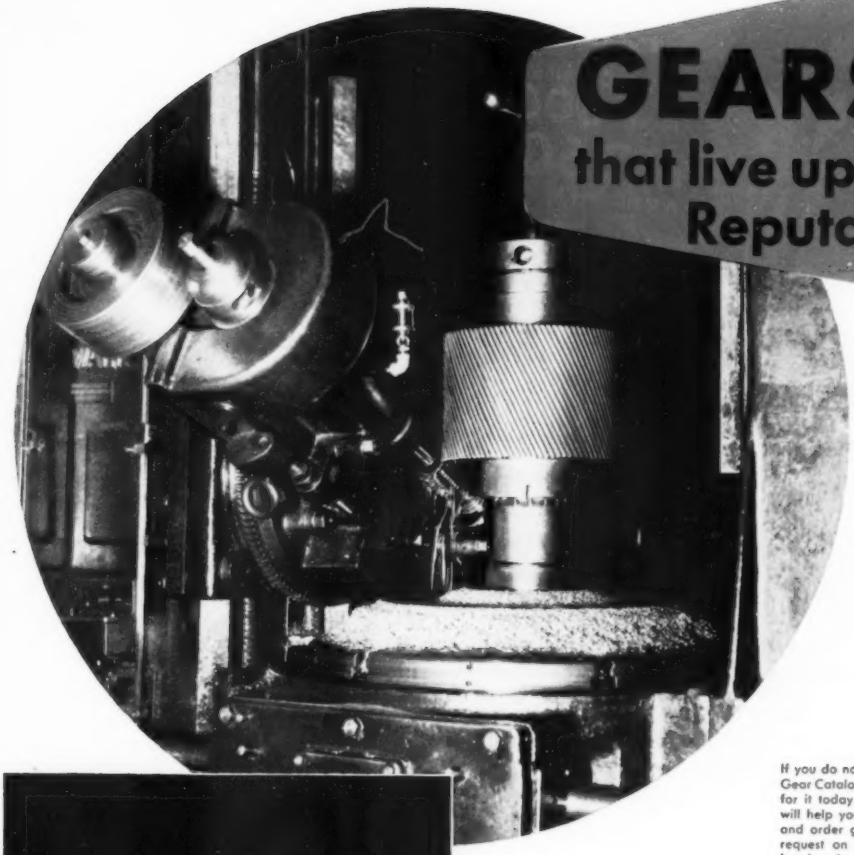
SQUEAL OR SQUIRM

REASON, judgment, and the assumption of responsibility are the qualities of a leader. The foreman who has these qualities and is faced with the problem of what to do about the stalling worker will have no compunction about "telling him off." The effect of one worker's dereliction is serious enough to affect the production of the whole group. The foreman is the pacemaker for his men. He is the standard and example for whatever cooperation is to be induced in them. He certainly cannot afford to keep quiet about meeting and solving any problems that arise in supervising his men and getting out the work.

No supervisor likes the idea of one of his workers coming to him with a tale about another worker laying down on the job. But his duty should be clear; he should not worry about hurting the feelings of the errant employee to such an extent that he keep quiet about the whole business. The culprit should be shown the error of his ways and how it affects his fellow-worker's production and the efficiency of the entire group.

I certainly would be less inclined to worry about encouraging tattletaling in the eys of the men than in showing the workers that efficiency in production is the foreman's aim, and that the stalling worker cannot get away with his deliberate

GEARS... that live up to a Reputation



Cutting a Philadelphia Helical Gear. These can be furnished up to 150" diameter.

If you do not have a copy of the Gear Catalog 48, you should send for it today. This 68 page book will help you understand, design and order gears. Just send your request on your business letterhead and a copy will soon be in your hands.

For nearly 60 years Philadelphia Gears have been known throughout industry for high quality and precision manufacture. Our modern plant contains the latest equipment for cutting, machining, hardening and testing every type of gear—large or small—and in any quantity. That's why we have been called "Gear Headquarters" . . . and why so many firms always rely on Phillie Gear for every gear need.

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Unique

Tool-room-built Machine Pays Big Dividends in Hollow Milling and Counter Boring Die Cast "Protek" Plug

To get high production quickly in special machining operations is a problem die casters run into every day. Machining by hand on standard machine tools is too slow, too costly. Expensive, custom-built special purpose machines are often out of the question.

But if you have a tool engineer or designer with imagination, you can build many special purpose machines right in your own tool room, quickly and inexpensively.

The machine shown above was designed by S. J. Biello of Harvil New England Corporation and built in their own tool room. Two standard drill presses, and two Bellows electrically controlled Drill Press Feeds; a dial table and ejection device powered by two Bellows Air Motors, made a machine that was so fast it required two operators to keep pace with it.

Ingenuity and Bellows "Controlled-Air-Power" Devices help thousands of manufacturers get better, faster and safer production in second-operation die cast machining.

Would you like the complete story on this and other die cast machining operations?

Write for Foto Facts File FF47-778 and for a copy of "Faster, Safer, Better Production." Free on request. Address Dept. AM851, The Bellows Co., Akron 9, Ohio.

1267

The Bellows Co.
ESTABLISHED 1[illegible]
AKRON 9, OHIO

attempt to slow down the work. This type of misdemeanor may be contagious if allowed to continue, and if it becomes the general knowledge of the rest of the workers, their confidence in the foreman's ability will be lost, with consequent inefficiency in the shop. The only sensible solution is "putting it straight" to the worker in question. The foreman should hew to the line of right and let the chips fall where they may. No matter how well-run a department may be, it is impossible to foresee all the human problems and frictions that may arise. The foreman cannot always anticipate the specific problem, but he can develop sound procedures for dealing with problems when they do occur.

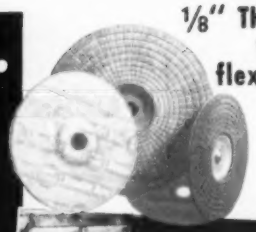
One of the least enjoyable tasks of a foreman is to reprimand workers. The occasion for a reprimand is one for testing the caliber of supervision and is an opportunity for teaching. The primary objective is not punishment, but to change the worker's behavior and thinking in the direction of desired action and to insure that the behavior leading to the reprimand is not repeated. But the foreman should be sure of his facts; he should hold his criticsm in check long enough to be sure it is constructive and just. Most cases call for training, not blame. In any event, he should check on the validity of the information he receives from one employee about the negligence of another employee. If the facts indicate that the condition reported exists, the foreman should be specific in his charges. To be most constructive, the criticism must be to the point; the worker must be told of definite instances in which he has done things wrong.

In criticizing his performance, his

"Ha, ha, sure I remember the time I snuck up and painted the ol' man's shoes—why?"

New... DuraCut Abrasive Discs

1/8" THICK yet flexible



Blending weld on stainless steel tank.

Smoothing weld bead.

IF YOU'RE LOOKING for a BETTER WAY...

. . . to blend welds and similar jobs, at a lower cost with greater productivity, investigate the vast possibilities of DuraCut Abrasive Discs. These new multiple layer abrasive discs, are *flexible, strong, safe,* offering many advantages over the ordinary single layer type of coated discs.

- MAXIMUM FREEDOM OF CHIP DISPOSAL (segment patterned)
- INCREASED LABOR SAVINGS (less disc changing)
- FASTER, SUSTAINED RATE OF CUT (built to grinding wheel specifications)
- 10-25 TIMES LONGER LIFE (over 1/4 million more cutting particles)
- WITHSTAND LONG CONTINUED FLEXING (extra matted reinforcing)

Removing rust and scale.

Removing weld spatters.

The only really flexible grinding wheel ever offered!

Order Today for a Trial:

Sizes available for immediate shipment
7 x 1/8 x 7/8 } In any of these
9 x 1/8 x 7/8 } grit sizes: 36, 54, 80

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WHY? Because everybody wants the *best* equipment!

The man who *works at it* wants a HALLOWELL Bench because he likes its *convenience*, its *smooth, durable work surface*, and its *rock-solid "stance"*.

The man who *buys* it wants a HALLOWELL because its *standard-unit* design simplifies plant layout, its *trim, good looks* improve shop appearance, and its *tough, steel construction* eliminates maintenance and replacement for years to come.

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STANDARD PRESSED STEEL CO.

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work should be compared to a standard that has been set up for the department, and not to the performance of a fellow-employee. Criticism in generalities is not constructive because it does not give the worker definite ideas on how he may improve. The interview should never end without pointing out to the worker the way in which he can do better next time. He should be made to feel that he can and will improve, and that the foreman understands that what is happening is a matter strictly between the worker and the foreman. The errant worker should be brought back to reality with a firm assertion that the foreman wants to give him a fair deal but that nothing can be accomplished by an unreasonable attitude on his part.

Harry Kaufman
Philadelphia, Pa.

•

SKILL STEALER

LABOR STEALING can hardly be considered an offense because, presumably, the people who move, do so as free agents and of their own will. What a stodgy place the world would be if no one changed his or her job! Change and movement in the labor force of a factory or a nation is the natural fertilizer of industry, just as the continual movement of soil by worms, moles, etc. increases the fertility of the land. Without change, much color would go out of life, and enterprise would largely become a dead thing, lacking the spur of competition to keep it alive. When we become static we head for disaster; change feeds the dynamo; and the dynamic in a man or woman is what an employer pays for.

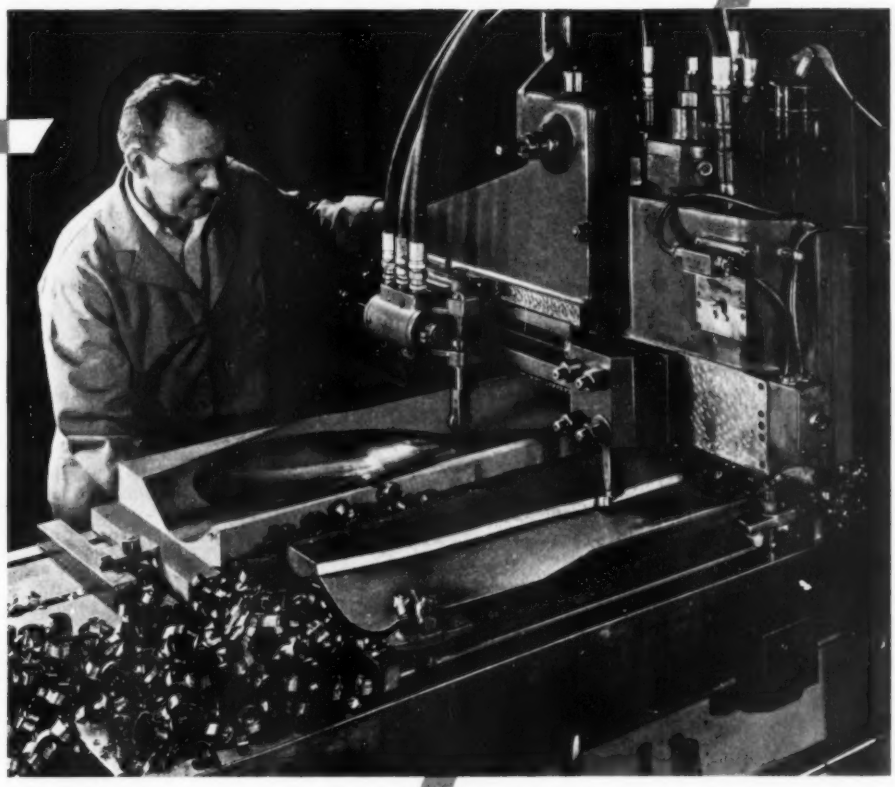
Freedom of movement whets the appetite of the ambitious employee and encourages him to fit himself for greater responsibilities, thereby skill and experience are enhanced and thereby industry moves forward to greater triumphs.

If good employees elect to find work elsewhere, the employer can examine the facts impartially, and he should not be misled into blaming, say, a one-time foreman of his for enticing his men away. Few men leave a good job to follow a foreman just because they like him. Unless the foreman concerned can offer better conditions or wages, or both, he is not likely to take many, if any, of his previous men with him. Having digested that truth, the losing employer should examine wages and conditions in his own establishment and compare them with what

KOPY-KAT
ROCKFORD MACHINE TOOL CO.

DUPLICATES *Complex forms*

with ease of straight-production machining



. . . on hydraulic shapers, planers and slotters

DIRECT TRANSFER — NO INTERMEDIATE MOTIONS

The Kopy-Kat is so sensitive, so exact, that positive duplication of complex forms is done with the ease of straight-production machining. Contours or full forms are produced, using inexpensive masters mounted on the cross-rail or table. A stylus transfers the form *directly* to the tool head through the patented hydraulic duplicator valve. Inaccuracies are eliminated by the absence of intermediate motions.

FAST WORK — LESS COST With the new Kopy-Kat you can turn out odd-shaped parts rapidly and economically for implements, aircraft, jet, turbine and other defense assemblies. Much time and money are saved with inexpensive masters, or by using the orignal form itself. Tooling and fixtures are greatly simplified.

Ask a Rockford Hydraulic representative to show you how the Kopy-Kat can simplify your form-machining problems. He can give you the complete story, with examples on many irregular mathematical curves and shapes.

For a quick picture send for Data Sheets No. 12.

ROCKFORD MACHINE TOOL CO.

2500 KISHWAUKEE STREET • ROCKFORD, ILLINOIS

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Hy-Draulic

Never Before

SO MANY ADVANTAGES for HIGHEST PRODUCTION

4800 PER HOUR!
3800 PER HOUR!
2500 PER HOUR!

For Top Production

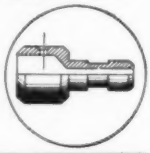
SNOW

FULL UNIVERSAL MACHINES

Air operated, electrically controlled Snow tools are establishing amazing production records daily on a wide variety of work. Just note these typical examples:

DRILLING

Crossdrill and C'T" Sink 1/16" Hole
Material—Brass
Production—4800 per hour
Fixture—#15 Vertical index
Equipment—#1-UD Drilling Machine

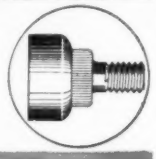


TAPPING

Tap Two #10-32 Holes
Material—Steel stamping
Production—3800 tapped holes per hour
Fixture—#14 horizontal index
Equipment—#1-UT tapping machine

THREADING

3/8"—24 Thread—1/2" Long
Material—Die Cast Aluminum
Production—2500 per hour
Fixture—#10 Drum dial
Equipment—#3-TR Threading machine



Snow air operated—electrically controlled machines have built in full universal controls that allow selection of the type of spindle cycle desired. This feature also permits instant synchronization of the standard Snow Master Fixtures. All types of air operated automatic and semi-automatic jigs and fixtures are carried in stock. Standardization permits low cost tooling—and—high production.

Sensitivity of power application prevents tool breakage.

Simplicity of control means that set up and operation can be handled by a less experienced operator with minimum fatigue.

SNOW
MANUFACTURING COMPANY
435 Eastern Ave., Bellwood, Illinois
(Chicago Suburb)

Single Spindle Verticals • Two-Spindle Verticals • Two-Spindle Horizontals • Automatic Nut Tapping Machines • Drill Press Tap Heads • Automatic & Semi-Automatic Jigs & Fixtures

Submit Sample Parts for Production & Cost Estimates

other owners have to offer. If the fault is there, the sooner he takes the necessary steps the better and the sooner will the abnormal leakage of skill adjust itself.

Many of us may and do have sentimental regard for some jobs we loved and left in pursuit of advancement, but while sentiment has its place in our lives, it should not be cherished to the exclusion of all other considerations. Most of us who have moved around have been genuinely sorry to leave some job at some time, but may have comforted ourselves with the thought of others, waiting an opportunity for a look in, or a step up. The changing around may inconvenience, sometimes quite seriously, the people we leave, but necessity is the mother of invention and a solution of the losers problem is almost sure to be at hand if enough careful thought is given to it.

The writer does not think that taking men from another shop calls for admiration, nor that such action is an indication of either nerve or influence on the part of the departed foreman. It more probably is, as Ed infers, a case of Hobson's choice, on the foreman's part, in an effort to win through on the new job. He is not likely to pack a new job with unwanted men just for the sake of taking them away from his old boss. If he is in urgent need of additional help and if the men he knows and trusts find it to their advantage to follow him, can they be blamed? In the same circumstance, what would you do, chum?

C. D. Mackinnon
Airdrie, Lanarksihe
Scotland

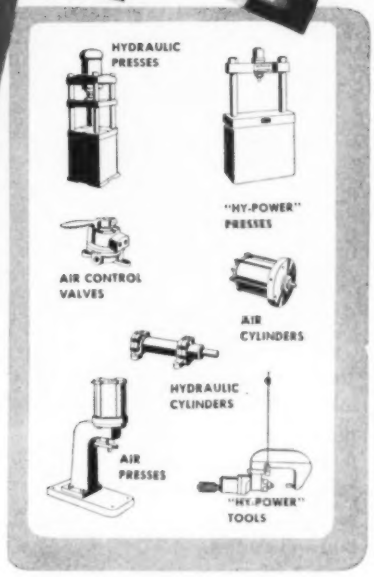
•

SO OUR FRIEND AL is hot under the collar about George pulling some of his trusted men along with him. Say, Al, this argument is right up my alley, because only recently I paid out good money to secure a good man to take charge of my toolroom. What do you think I took into consideration when I weighed values? The man alone? Not on your life.

I felt that my new executive possessed some characteristics that would eventually profit the company. I knew that he was a successful leader and respected in the field. When you find a man like George, who can command the respect of his men, you can bet your pay check that those men will think twice before causing any trouble. I don't owe the Peerless people anything, nor do I feel that I am doing them an injustice in acquiescing to George taking on a few

More on page 310

Here's Your Authority on HYDRAULICS and PNEUMATICS



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in the

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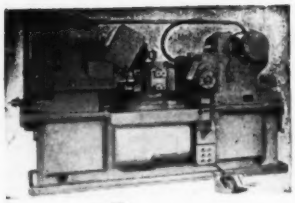

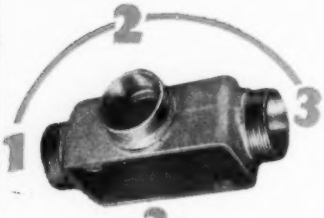

The outstanding **advantage** of this machine is **ability to handle** operations on **one**, two or three ends of a *piece* simultaneously or in sequence, *without changing set-up* or rehandling. It is the only standard machine that will do this.

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of their men if he can induce them to make the change.

It is my duty to the company as manager to do whatever I can to satisfy the stockholders by doing everything in my power to make a good profit. Call it labor stealing, if you want to. Call it what you will, but I call it free enterprise—do what you can if you can get away with it.

John Homewood
Ontario, Calif.

•

THIS is not a matter between employers and foremen; it concerns us, too —the workers. We have something to say as to whether we should consider a job offered by our former boss. Even though our old leader hadn't anything to do with our securing a position with the new outfit, should we be modest about it and refrain from taking the job simply because old George, our former boss, happened to be foreman there?

There seems to be an impression, among some of the lamebrains, that we should be barred from employment at the other plant for a time, at least. This is a wrestling match in which no holds are barred.

Business ethics or no business ethics, I want the right to work wherever I want to, providing I can get the job. I don't see why anyone should be able to tell me I can't leave my job and follow my old boss, who has always treated me square and for whom I'd do my darndest to please.

Now, the ethics between the boss and the firm he left, regarding him taking me on; I'm not in the least bit interested. What I am concerned with is my liberty, as an American citizen, in securing work wherever I can get it. Especially where I know I will be happy because of the decency of the man for whom I have already worked.

E. Pluribus
Ontario, Calif.

•

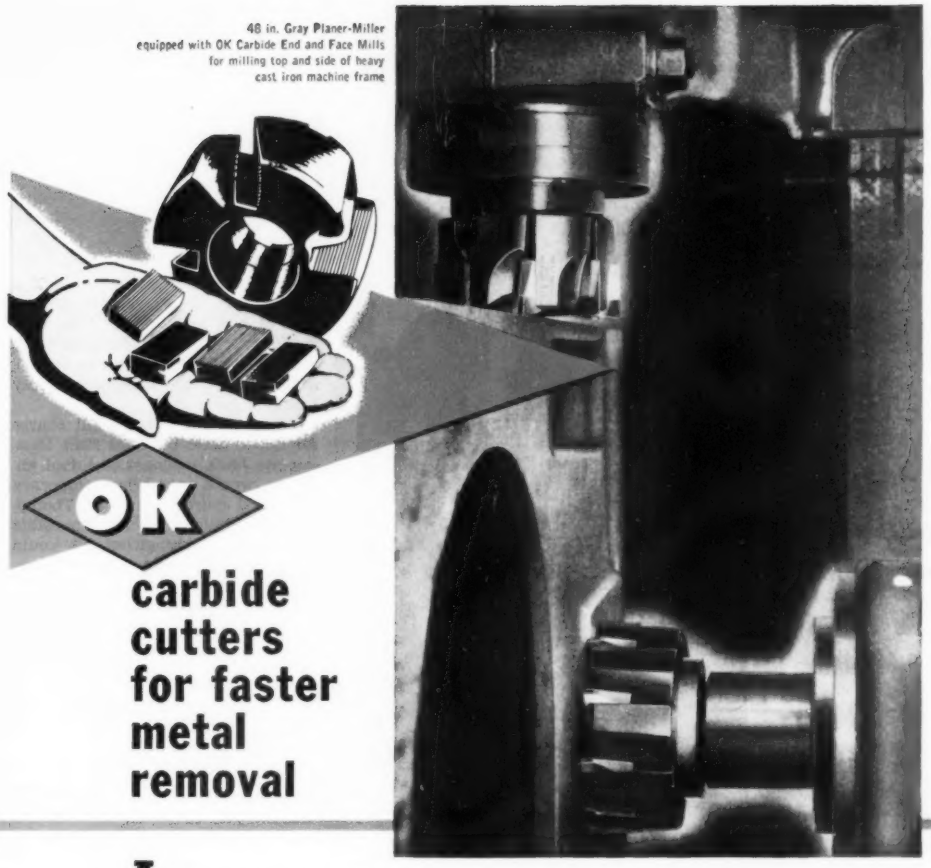
THEIRS NOT TO REASON WHY

IT SEEMS TO ME that this problem is very simple to answer.

First of all, the superintendent of the plant has to be broad-minded in cases of this kind. All of the smart people do not work in tool or engineering departments.

If a tool or design engineer makes a mistake, or does not visualize the full effects of the job from the standpoint of die construction, or production of the parts involved, he should not be thin-skinned and should be open to constructive

48 in. Gray Planer-Miller equipped with OK Carbide End and Face Mills for milling top and side of heavy cast iron machine frame



carbide cutters for faster metal removal

Authorities agree that rigidity is the prime essential in carbide milling. Adequate support of carbide tips and cutting edges is the first consideration, because the transverse rupture strength of available carbide cutting materials is relatively low. Two means should be used to provide adequate support: First, a cutter body substantial in size and strength, and second, bodies so designed that substantial support extends as close to the cutting edges as is practical, considering chip clearance and clearance for diamond grinding wheels.

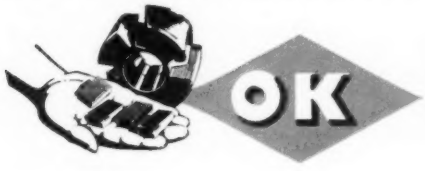
OK carbide milling cutters do provide substantial support in all necessary ways. The body is of heat-treated drop-forged steel and is of a design to support the blades close behind the cutting edges. The blades are of alloy steel with carbide tips brazed carefully into machined recesses in such a manner as to harden the blade.

Blade slots in the body are tapered, one side of the slot being flat, the other serrated. When the serrated wedge-shaped blades are driven into their respective slots in the body, the matching serrations prevent any lateral movement. No pins, screws, clamps or other holding devices are needed.

OK Carbide Milling Cutters are of the Dual Adjustable type. Three angles govern location of the blade in the body: the axial and radial rake angles and **the angle at which the blade is inclined toward the face of the cutter.** This combination saves you money and grinding time.

For when worn blades are advanced outward in the body by one serration, the ratio of radial to axial movement is about 4:1. This proportion is in accordance with our experience with wear of milling-cutter blades on medium and heavy-duty applications. Thus, most of regrinding is done along the side of the carbide insert which takes the maximum wear, thereby extending its useful life.

For complete details of OK Carbide Milling Cutters for milling cast-iron, steel and non-ferrous materials, write for a copy of Catalog 13, "OK Modern Milling Cutters for Modern Milling Machines."



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criticism. If he cannot take it, then he is the wrong man for the job he has been assigned.

I would say that the problem of changing the die should be taken through to top management if neccessary. Companies do not become big unless everybody pulls as a team.

W. R. Hufendick
Quincy, Ill.

•

POOR ED! He certainly was dismayed over the problem which a combination of unfavorable circumstances had forced upon him. Suggestions to the chief designer from a mere shop foreman on the matter of design? No! No! Thompson simply wouldn't have that.

There was only one right course for Ed, to take: the hard road. Passing the buck to Jones, the tool engineer, would only bring temporary relief and cause more delay. Thompson, the designer, was responsible and before a design of his could be departed from, he would, in fairness, require to be consulted. Had a good suggestion scheme been in operation in the plant, Ed's worry need never have arisen, Pierce could then have put forward his suggestion as a matter of normal routine with, perhaps, a covering note from Ed regarding the urgency of the matter.

C. D. Mackinnon
Lanarkshire, Scotland

•

WHAT'S NEXT BOARD

WORKING on the principle that "coming events cast their shadows before," the 'what's next' board offers an ingenious method for letting the workers know that there's more work ahead and what the jobs are. It gives the men a chance to get set for the next jobs to be assigned them individually.

The new chart listing advance jobs will not be construed as a work pusher by the intelligent worker. It is not a production-control gadget, although it could well serve as an appendage to a production-control board. The fact that the 'what's next' board shows several jobs ahead for each machine cannot be considered as a pushing device to speed up work unnecessarily. Although the worker sees that there is work waiting, it will not necessarily make the man work faster. Of course the foreman is interested in getting out the work faster, but I have yet to see such a device as the 'what's next' board push anybody to do extra work.

However, the reasoning in back of

JOHNSON'S WAX LUBRICANTS perform "impossible" draws!

Because of their ability to "stay with" the metal on which they are applied, Johnson's Wax Lubricants for drawing and forming metal offer results unobtainable with conventional lubricants.

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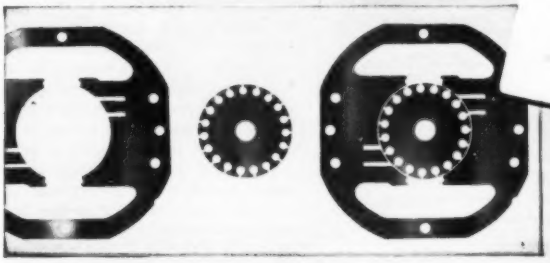
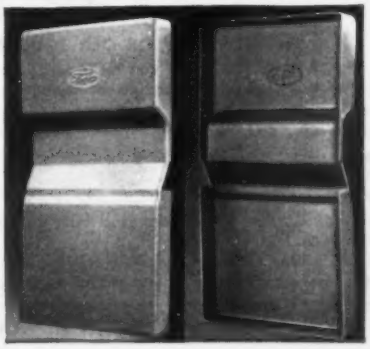
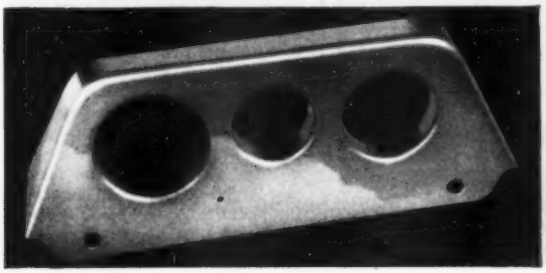


Above, Johnson's Wax Lubricant used for lamination stamping increased sets per die grind from 45,000 to 65,000.



Right, Car radio case of hot rolled steel—impossible to draw with common lubricants—perfect consecutive draws with Johnson's Wax Lubricant.

Below, Telephone coin receptacle of No. 405 stainless steel drawn with Johnson's Wax Lubricant. No perceptible tool wear after thousands of successive perfect draws.



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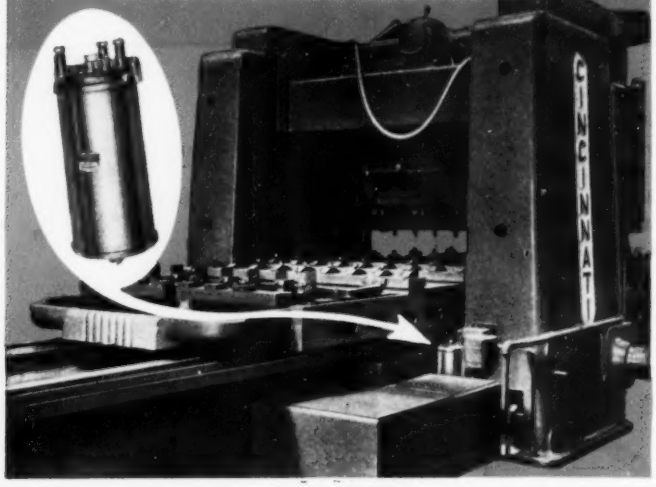

Giddings & Lewis Machine Tool Co., of Fond du Lac, Wisconsin, installed a GENERAL AF-500 FILTER as original equipment on their 72" Cincinnati HYPRO Rail Guide Planer. This trend toward GENERAL is industry-wide. Manufacturers of quality machine tools want the longer machine life and lower maintenance costs that General Industrial Filters insure. That's why you'll find more and more GENERALS giving low-cost, day-by-day protection wherever volume quantities of lubricating or hydraulic oils are used.

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posting jobs to come for the whole shop to see has one good motive in mind, and the workers will do something in the right direction as a result of this posting device. The average worker will see in black and white that there is more work ahead and the nature of the work, and it will undoubtedly give him a chance to get set for it in his mind and show him that he is not working himself out of a job. In this manner the men will be encouraged not to worry and be able to perform more efficiently. It could well result in greater production and higher-quality work.

The use of the 'what's next' board is not a means for needling the men. Some worker may feel that the foreman is laying on the pressure by graphically telling him that as soon as he gets a certain job finished he immediately wants him to get started on another. However an honest study of the 'what's next' board will demonstrate that the foreman is not singling out any particular worker but is systematically assigning jobs. The efficient worker will take no exception to this idea. It certainly does not do away with flexibility in assignment nor tend to develop objections when jobs are reassigned because these prerogatives always will be the foreman's baby. I do not question the wisdom or advisability of posting such a board either from the standpoint of alleged undesirable effects on the workers' peace of mind or the foreman's authority in assignment flexibility. It does not, in my mind, constitute any intimation that the foreman is waiting for the workers to finish what they are working on currently, and forcing them to immediately speed up their present jobs and start without a breath of relief on new ones.

By means of the board as an adjunct to the regular planning operation, the workmen are left free to do the work as planned and arranged for; and the foreman to coordinate efficiently and utilize the equipment, materials, and labor in the best possible manner. The foreman is given greater opportunity to develop the technique of planning by experience, and the compilation of data. As a result, the continued use of the board will develop planning experience.

In my mind, the use of the 'what's next' board will help the foreman exercise more intelligent control over the manufacturing operations in his department. It is an effort in the right direction to establish a better

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shop organization and greater production control.

The 'what's next' board is a type of visual control which will prove valuable to the busy foreman. It is a more economical means of obtaining information on the status of work than a mass of statistical data from the accounting department. With amplification in listing scheduled completion dates of jobs as well as names of workers to whom jobs are being assigned, it will portray time in relation to progress on jobs, and disclose details of operation. Causes and effects would become immediately apparent, and responsibility for results definitely placed. A further merit of the board is the ease with which facts could be made understandable to foreman and worker alike. A chart of this nature pictures a situation as a map does the countryside.

Harry Kaufman
Philadelphia, Pa.

•

A PRODUCTION SCHEDULE BOARD is one tool that no foreman need ever apologize for having, and a tool against which no workman can register a single legitimate complaint.

The job-ahead idea is very old, perfectly sound, and is primarily an aid to management. As a matter of fact, it is invaluable to management, because it aids them to plan ahead, to see that necessary material, not only is ordered, but is in the plant and on hand; to see that stock is cut up in advance and delivered to machine or work center before it is needed; to insure that special cutters are ground and ready; to see that fixtures and gages are ready when needed. In short to have everything waiting for the operator when it is time to start on the new job.

I remember another 'job ahead' board. At the time, I was planning my first shop. I asked the various foremen what new machines we needed the most. Unanimously, they all cried, "Planers."

Their answer didn't sound right to me, but I promised to look into their complaint. I did investigate. We had six planers for a shop employing some 800 men. The shop plans were not yet complete. Apparently there was a mountain of work ahead of the planing department.

Without making any comment, I went to the electrical engineer; and made arrangements to have a recording watt-hour meter hooked on to the power feed line to the planer motor, of the one planer I was told

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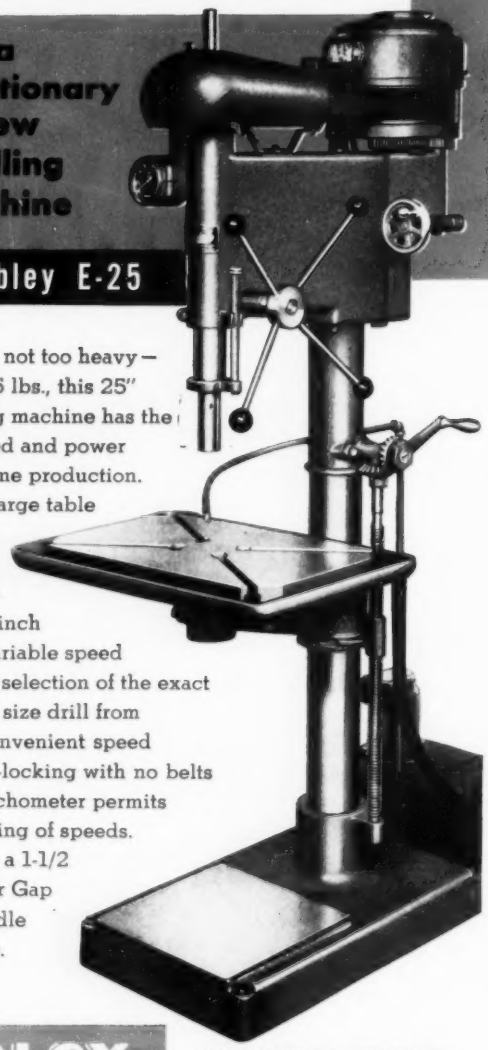

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was the busiest machine in the shop. I didn't tell the operator the purpose I had in mind, but simply said we were considering buying new planers, and wanted to measure the efficiency of those we had.

A week later, I went back, took off the accumulated roll of paper, and reset the machine. I repeated this for three weeks, and then I sat down, studied my rolls of paper, and did some calculating.

I was amazed at my results. That planer, which everybody said was the busiest machine in the shop, was only cutting metal 8% of the time it operated, and that was one 9-hour shift a day. I rechecked the graphs and then started on a hunt to find out what was happening the rest of the time. That was a very simple task.

Now, of course, everybody knows a planer cuts in only one direction; but this was a quick-return job. Some lost time was due to tool grinding, but the real loss was in the change-over and unplanned operations.

I called all concerned in, and laid down the law: I told them exactly what I thought about their planer situation, and what I proposed to do about it.

I had three boxes placed at each planer, and had them stenciled with the words "Working," "Next Job" and "Job Ahead." I arranged to have setups planned in the office, and in each box I had the blueprints, work orders, tooling and setup sketches and instructions placed in the boxes for the jobs ahead. We had the work delivered to the machine in advance, and then we were ready to move.

Now when I had called the boys in and told them what I had learned about their planers, they questioned my figure of 8% cutting time on Swede's planer. So I showed them my charts, explained the process of reading them, and let them see just how I had arrived at my figures. I explained to them that we'd put a new roll in the machine and study results under my system.

Then the boys taught me something. The morning after I had explained the use of the machine, and my intentions for the future, I found the watt-hour meter hopelessly ruined. A piece of lineshaft had been dropped on it. The boys said it slipped from the crane—nobody knew just how.

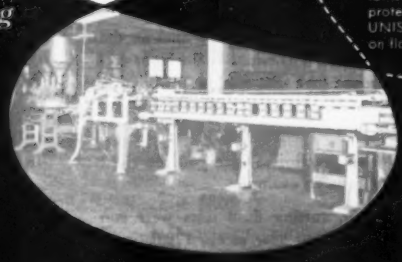
So the company paid $350 to have it repaired, and I learned that work-recording machines need body-guards. Someone neglected to teach me that in college.

I gave up the idea of metering the machine, but I kept a closer per-

Pneumatic Scale Packaging Machine mounted on UNISORB * at River Brand Rice Company, New York; a fine example of how UNISORB'S elimination of the need for anchoring-bolts and lag screws protects the value of plant floors. UNISORB is equally effective on flooring of every kind.

No Floor Drilling

When You Mount Machinery on



UNISORB®

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All the Facts on Unisorb TODAY

Old-fashioned, destructive floor drilling is gone . . . for good . . . when you anchor your machinery the modern way, on UNISORB.

UNISORB-Mounting requires no bolts, no lag screws. A special cement (we supply it) grips the machine foot to the UNISORB pad and tightly bonds the pad to the floor with a *minimum* holding strength of 5000 lbs. per square foot. *And installation time is shortened — saving man-hours and money.*

Moreover, UNISORB-Mounting eliminates 60-85% of all transmitted machine noise and vibration . . . which means prolonged machine life, as well as a lessening of stress on floors and buildings . . . and quieter working conditions for improved efficiency and morale.

Don't you agree that now, of all times, you should

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In a large gear department, cutting fluid tests were run on Gleason Revacycles cutting 8620 gear stock, 179 Brinnel hardness.

	"X" Oil	Stuart's SPEEDKUT "A"
Gears Per Tool Grind.....	1200	3200
Stock Removal to Recondition Cutters	.009"	.0035"
Price of Cutting Oil.....	33c/gal.	35c/gal.

There's a story! More production because of less downtime. Longer cutter life because of fewer grinds and less stock removal per grind. A lower *actual cost* for the cutting fluid.

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GET MORE PRODUCTION
Use The Right Cutting Fluid

STUART SERVICE
Goes with every Barrel
Offices in Principal Industrial Centers

D.A. Stuart Oil CO.
2729 S. Troy St., Chicago 23, Illinois

sonal eye on those 'Job Ahead' boxes. Those planers did better—believe me, they did.

And so when I hear of somebody having the nerve to kick about planning jobs ahead for each machine, I refuse to worry. That's the way it should be—so what?

James K. Matter
Detroit, Mich.

•

OFF AGAIN, ON AGAIN

TO HIRE A man one day and let him go the next is a mistake—and a pretty expensive mistake. Admittedly if he is no good, steals, picks a fight or tries to set fire to the place, the only thing to do is get rid of him, fast. Write off the expense and minimize the loss. On the basis that it costs around $25 to hire a man in an average shop he represents quite an investment. Advertising, interviewing, aptitude tests, medical exams, records are all expenditures made in time and material before the new man so much as sets foot in the shop.

Perhaps management is making a mistake in not advising their responsible personnel on the hiring and firing line that such actual cash losses are possible.

Therefore, Ed, in letting this man go after one day, made a mistake, and cost his company money—over and above the charges entailed in the ruined valuable "master spring tool" that was the cause of the unfortunate chap's dismissal. I say unfortunate because the fellow was a victim of an accident and lost his job. What is worse he was subjected to, though he probably didn't realize it, a slice of gross mismanagement. Indirectly, the unfair treatment in this instance has cost the company still more, in intangible damage to their good public relations.

Ed's prime mistake was in overlooking the investment his company had in the newly hired man and using precautions to protect it.

Regardless of how good the man claimed to be, the impression his starting rate may have set as to his qualifications, or the company's expectations; to set him cold at what sounds like case of the hottest jobs in the shop, was foolhardy.

Any player is entitled to a warm-up. You don't pay out good dough for a brand-new car, drive it out of the showroom and see if it will do 100 mph right off the bat. It may, but you're taking a chance on your investment. You don't take a plane up on cold engines. Dump a full load

Continued on page 204

subcontracting NEWS

New Heavy Military Truck Will Require Hundreds of Suppliers

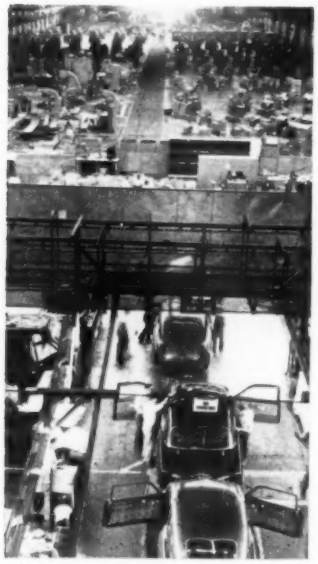
PONTIAC, Mich.—The GMC Truck & Coach Div. will produce an entirely new military 6 x 6 truck equipped with Hydra-Matic drive, to be designated the M-135. Hundreds of suppliers, both within and outside General Motors, will provide parts and materials necessary for assembly of the truck, it was announced by Roger M. Kyes, vice president of GM and general manager of the division.

Powered by a new GMC 6-cyl (302 cu in.) engine, developing 145 hp, the 6 x 6 (meaning six wheels, all six power-driven) hits a maximum speed of 58 mph carrying a 10,000-lb load. It is equipped with "snorkel" devices for traveling submerged in water on deep-forging operations.

The Hydra-Matic transmission built into the new super-truck has eight speeds forward and two in reverse. Automatic front wheel drive engagement occurs in the transfer case to provide extra traction when needed. The front axle is free-rolling in highway service when power is delivered only to the two rear axles. When the truck hits rough terrain, however, power is automatically applied to the front wheels when the rear wheels lose traction.

The new M-135 uses torque rod suspension for the front axle in combination with regular leaf springs. A fixed secondary spring has been added to the articulated rear main spring.

Overall length of the new truck is 267 in., 11 in. longer than the world War II model, but it is two inches lower at 105 in. and has a shorter wheelbase. Weight empty is 12,200 lb, compared to 10,800 for its predecessor.



AUTOMOBILES are shown on the trim assembly line at the Kaiser-Frazer Willow Run plant, against a background of hundreds of metalworking machines for aircraft production. In addition to normal output of autos, K-F is manufacturing Fairchild C-119 cargo and personnel planes for the Air Force. The company is also building Wright R-1300 aircraft engines and components for Lockheed Naval patrol bombers

To Build Rocket Motors

YORK, Pa.—A long-term contract for more than $2.5 million to build large naval aviation rocket motors has been awarded to York Corp. Initial work will begin before the end of the year in the Grantley plant. Approximately 100 persons will be assigned to the project on a two-shift basis. During World War II York built several types of rockets for the armed forces.

New Guided Missiles Plant

POMONA, Calif.—Construction will start this month on America's first integrated mass-production plant for guided missiles—a $40 million U.S. Navy facility to be operated here by Consolidated Vultee Aircraft Corp.

Convair's Guided Missile Div., now located at San Diego, will supervise plant construction, operate the government-owned factory and build supersonic interceptor-type missiles for the Navy's Bureau of Ordnance.

The division will employ several thousand persons, including electronics, electrical, mechanical and aeronautical engineers.

DEFENSE CONTRACTS

ARMY ORDNANCE AWARDS

Tank-Automotive Center, Detroit

Cushman Motor Works, Inc., Lincoln, Nebr.—motor scooters.

A. J. Miller Co., Bellefontaine, Ohio—ambulance, automobile.

Auto Car Sales & Service Co., Ardmore, Pa.—chassis, trucks.

Bryant Heater Co., Cleveland—spindle with hub wheel assembly.

Simmons Boiler & Machine Co., Detroit—frames.

International Products & Mfg. Co., Chicago—drive pulleys.

La Crosse Trailer Corp., La Crosse, Wis.—semi-trailer, low bed.

Truck & Coach Div., GMC, Pontiac, Mich.—bus on chassis; ambulance, truck; regulators; wrecker, truck.

Adam Black & Son, Jersey City, N. J.—semi-trailer, platform.

Warner Gear Div., Borg-Warner Corp., Muncie, Ind.—input shaft.

Four-Wheel Drive Auto Co., Clintonville, Wis.—truck tractor.

Trailmobile Co., Cincinnati—semi-trailer, platform; spare parts.

K. K. Wilson Co., Buffalo, N.Y.—hydraulic press.

Worden Specialty Co., Plymouth, Mich.—turret.

Gar Wood Industries, Inc., Wayne, Mich.—partitions, dump cargo body assembly.

Herman Daniels Gage & Tool Co., Detroit—arbor presses.

Wire Assemblies Corp., Detroit—extension kits.

R. K. LeBlond Machine Tool Co., Cincinnati—engine lathe.

Monarch Machine Tool Co., Detroit—engine lathe.

Western Reserve Mfg. Co., Cleveland—camshaft worm.

Mott Haven Truck Parts, Inc., Bronx, N.Y.—differential, rear axle

Ramsel Industries, Inc., Chicago—ventilating fan.

International Harvester Co., Washington—trucks, panel, pickup, cargo, dump, and tractor; 29-passenger buses.

National Air Sander, Inc., Rockford, Ill.—pneumatic sander.

Clayton Mfg. Co., Elmonte, Calif.—high-pressure cleaner.

Dockson Corp., Detroit—regulators acetylene pressure.

DeVilbiss Co., Toledo—air compressor.

D. W. Onan & Sons, Inc., Minneapolis, Minn.—ac generators.

Kent-Moore Organization, Inc., Detroit—headlight tester.

Black & Decker Mfg. Co., Towson, Md.—refacer valve.

Diesel Engine Div., GMC, Detroit—housing assembly, drive shafts, manifold, air intake assembly.

Corbett Co., Henderson, N.C.—truck tractor, 10- and 15-ton.

Pontiac Motors Div., GMC, Detroit—automobile sedan.

Gramm Trailer Corp., Lima, Ohio—semi-trailer refrigerator.

Fruehauf Trailer Co., Detroit—semi-trailers, low bed, platform, van and cargo; spare parts.

Pioneer Gen-E-Motor Corp., Chicago—battery charger.

Kellogg Div., Rochester, N.Y.—air compressor.

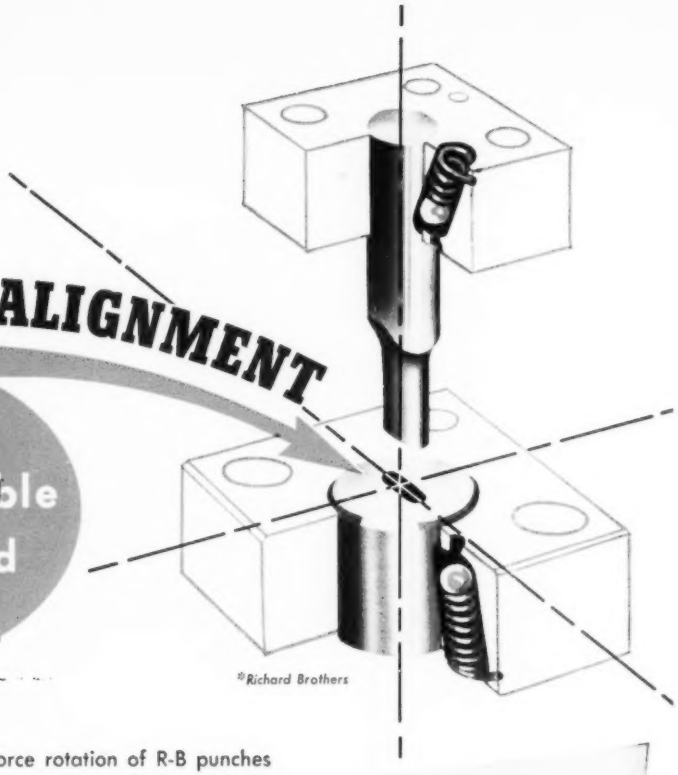
Neff Equipment Co., Toledo, Ohio—axle and wheel alignment machine.

Lou Industries, Taylor Center, Mich.—flare boxes.

(Continued on page 197)

POSITIVE ALIGNMENT

in R-B* Interchangeable Punches and Dies



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A Stillson wrench might force rotation of R-B punches or dies, but the heaviest of press usage will **never** budge them once they're locked in position. These time-and-money savers are easy to install and remove: just a push, a twist and "Click," the ball locks in the recess on the punch or die button.

The R-B ball lock **keeps** punches and dies perfectly aligned—both vertically and radially. Its positive alignment assures trouble-free piercing of even the most complex shapes. Why not send today for the whole story? **Allied Products Corporation, Richard Brothers Div.**

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More Subcontractor Exhibits

WASHINGTON — Subcontractor exhibits, enabling small businessmen to examine military items or parts for the Army, Navy and Air Force which they might make under subcontracts, will be held Sept. 10-12 at the Biltmore Auditorium, Atlanta, Ga., and at the Hollywood Turf Club, Los Angeles, Sept. 18-21. Permanent exhibits by Army Engineers for their own contractors and subcontractors are to be installed this month in 18 Engineer procurement offices.

ORDNANCE AWARDS . . . continued

Anco Screw Products, Inc., East Detroit, Mich.—exhaust clamps.
Spring Perch Co., Lackawanna, N.Y.—suspension springs.
Sterling Motors Corp., Milwaukee—dump truck.
Stewart-Warner Corp., Chicago—lubricating guns.
Continental Motors Corp., Muskegon, Mich.—engine pistons.
Eis Automotive Corp., Middletown, Conn.—repair kits.
Harrison Radiator Div., GMC, Lockport, N.Y.—transmission valves.
Fargo Motor Corp., Detroit—panel trucks; ambulance, truck.
Studebaker Corp., South Bend, Ind.—engine with accessories.
Fredericks Armature Corp., Jersey Shore, Pa.—armature.
Federal Motor Truck Co., Detroit—transfer springs.
Chevrolet Motor Div., GMC, Detroit—truck, stake and platform; spare parts for 100 vehicles.
Cadillac Motor Car Div., GMC, Detroit—Twin guns, 40 mm self propelled, concurrent spare parts; light tanks; machine tools.
Tarnow Electric Supply Co., Detroit—generator control.

Frankfort Arsenal, Philadelphia

Graflex, Inc., Rochester, N. Y.—unit sights and spare parts.
Inland Equipment Co., Nashville, Tenn.—heat shell.
Auto Solar Co., Atlanta, Ga.—unit sights.
Remington Arms Co., Bridgeport, Conn.—commercial primers.
Brown & Sharpe Mfg. Co., Providence, R.I.—screw machines, automatic.
Lester Phoenix, Inc., Cleveland, Ohio—limit switches.
Metal Specialties Mfg. Co., Chicago—recoil adapters.
Kruger-Barnes Corp., Detroit—machines.
W. M. Steel Co., Inc., Worcester, Mass.—machines.
Ex-Cell-O Corp., Detroit—machines.
U. S. Tool Co., East Orange, N.J.—machines.
Norton Co., Worcester, Mass.—machines.
Van Norman Co., Springfield, Mass.—valve refacer.
Bryant Electric Co., Bridgeport, Conn.—spare parts, fire control.
Underwood Corp., Hartford, Conn.—spare parts, carbide.
Royal Typewriter Co., Hartford, Conn.—spare parts, bar.
Safety Car Heating & Lighting Co., Inc., West Haven, Conn.—modification kits.
Seymour Products Co., Seymour, Conn.—magazine assembly, rifle cal .30.
Rostand Mfg. Co., Milford, Conn.—fire control instrument and spare parts.
Dockendorf Co. Inc., Bridgeport, Conn.—sight, front for rifle.
International Stamping Corp., Springfield, Mass.—tool, assembly.

St. Louis Ordnance District

United Auto Parts Co. Inc., Kansas City, Mo.—windshield defroster.
Universal Match Corp., St. Louis, Mo.—hydraulic press.
Hornady Sporting Goods Co., Grand Island, Nebr.—detonators.
Heckethorn Mfg. & Supply Co., Littleton, Colo.—motor parts.
Emerson Electric Mfg. Co., St. Louis—motor parts.
Knapp Monarch Co., St. Louis—projectile.
Barrett Equipment Co., St. Louis—brake drum lathe.
Ritepoint Co., St. Louis—fuses.

Detroit Ordnance District

Cadillac Motor Car Div., GMC, Detroit—automotive service parts.
Ainsworth Mfg. Corp., Detroit—automotive parts.
Algonac Mfg. Co., Algonac, Mich.—automotive parts.
Continental Motors, Inc., Muskegon, Mich.—automotive parts.
Detroit Display & Cabinet Co., Detroit—automotive parts.
Van Craft Tool & Mfg. Co., Detroit—automotive spare parts.

New York Ordnance District

Western Electric Co., New York—spare parts, gun director.
Unexcel Chemical Corp., New York—grenade fuse.
S. W. Farber, New York—rocket head parts, machine tools.
Universal Camera Corp., New York—spare parts, fire control.

ARMY ENGINEERS AWARDS

Corps of Engineers

Chicago Procurement Office

Miller Wrapping & Sealing Machine Co., Chicago—heat-sealer machines.
Bradford Machine Tool Co., Cincinnati—electric drill.
Buffalo Forge Co., Buffalo, N. Y.—drill press.
South Bend Lathe Works, South Bend, Ind.—engine lathes.
Buffalo-Springfield Roller Co., Springfield, Ohio—spare parts.
American Bosch Corp., Springfield, Mass.—spare parts.
Homelite Corp., Port Chester, N. Y.—spare parts.
Tyson Bearing Corp., Massillon, Ohio—spare parts.
Timken Roller Bearing Co., Canton, Ohio—spare parts.
Chrysler Corp., Dayton, Ohio—spare parts.

New SC Procurement Office

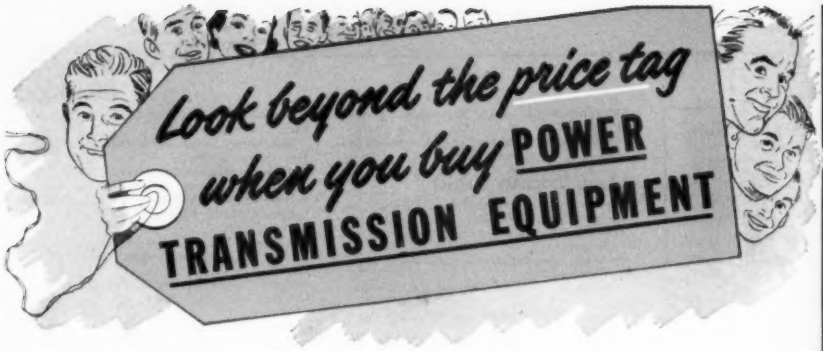
WASHINGTON—The Army Signal Corps has consolidated its procurement and industrial mobilization branches to better meet its problems. As mobilization plans progressed, the planning and current procurement activities have come closer together. The consolidated office will be known as the Procurement Branch of the Procurement & Distribution Division, Office of the Chief Signal Officer.

Hercules Motor Corp., Canton, Ohio—spare parts.
Manitowoc Engineering Works, Manitowoc, Wis.—spare parts.
Pioneer Engineering Works, Inc., Minneapolis, Minn.—spare parts.
Ingersoll-Rand Co., Chicago—spare parts.
Illinois Auto Electric Co., Chicago—spare parts.
Hobart Bros. Co., Troy, Ohio—spare parts.
New Departure Div., GMC, Bristol, Conn.—spare parts.
Thew Shovel Co., Elyria, Ohio—spare parts.
Iowa Mfg. Co., Cedar Rapids, Ia.—spare parts.
Waukeshaw Motor Co., Waukeshaw, Wis.—spare parts.
LeRoi Co., Milwaukee, Wis.—spare parts.
Hyster Co., Portland, Oregon—revolving cranes.
Caterpillar Tractor Co., Peoria, Ill.—wheel tractors.
Fruehauf Trailer Co., Detroit—trailers.
J. I. Case Co., Racine, Wis.—mowers, tractors.
Worthington Mower Co., Stroudsburg, Pa.—mowers and tractors.
Allis-Chalmers Co., Milwaukee—tractors spare parts.
International Harvester Co., Melrose Park, Ill.—tractors.

SIGNAL CORPS AWARDS

SC Procurement Agency, Philadelphia

Munston Mfg. & Service, Inc., Islip, L.I., N.Y.—test equipment; battery tester.
Friez Instrument Div., Bendix Aviation Corp., Baltimore, Md.—radio sonde.
Westen Electric Co., New York—armature.
Espey Mfg. Co., New York—test equipment, meters.
Automatic Radio Mfg. Co., Boston—auxiliary interphone.
Cooper & Cooper, Chicago—tool equipment.
Joseph J. Braideman, Chicago—tool equipment.
Cornell-Dubelier Electric Corp., South Plainfield, N.J.—power supplies; vibrator units.
P. R. Mallory & Co. Inc., Indianapolis—power supplies.
Briggs & Stratton Corp., Milwaukee—engine parts.
Standard Transformers Co., Chicago—transformers and coils.
RCA Victor Div., Radio Corp. of America, Camden, N.J.—antennas.
Triplet Electrical Instrument Co., Bluffton, Ohio—commercial meters.
Stanley Knight Corp., Chicago—tool equipment.
Hickok Electric Instrument Co., Cleveland—test equipment.
J. H. Holan Corp., Cleveland—trucks.
Automatic Electric Sales Corp., Chicago—telephone equipment.
Century Tool Co., Philadelphia—tool equipment.
Emerson Radio & Phonograph Co., New York—radio set, maintenance parts.
Taffet Radio & Television Co., New York—public address set.
Precision Associates, Brooklyn, N.Y.—antennas.
Wickes Engineering & Construction Co., Camden, N.J.—coupling units.
General Radio Co., Chambers, Mass.—interpolation oscillator.
Air Design, Inc., Upper Darby, Pa.—transformer.
Continental Electronics, Ltd., Brooklyn, N.Y.—interphone set, maintenance parts.
Western Electric Co., New York—converter set.
General Development Corp., Elkton, Md.—telephone repeater.
Shellcross Mfg. Co., Collingdale, Pa.—test set.
Triumph Mfg. Co., Chicago—volt meter.
Industrial Television, Inc., Clifton, N.J.—multimeter.
Garod Radio Corp., Brooklyn—radio.
Gates Radio Co., Quincy, Ill.—mobile radio receiving station.



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LOST: $164.18, including a whole tankful of valuable chemicals

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Cost of inferior speed reducer	$198.78
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Value of spoiled chemicals	$100.00
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Cost	$140.50
Cost of "bargain counter" motorized speed reducer	$134.80
Difference in cost	$ 5.70
Cost of pulling down conveyor and replacing defective speed reducer (2 men, 4 hrs., @ $2.25 per hr.)	$ 18.00
Cost of toting parts while conveyor was idle (6 men, 6 hrs., @ $1.35 per hr.)	$ 48.60
Loss of profit and overhead	$ 83.80
NET LOSS	$155.90

The *hidden quality* in BOSTON Reductors and Ratiomotors stems from BOSTON *Gear's* strict materials control, master craftsmanship and rigid inspection system, backed by 71 years of experience in the manufacture of standardized, interchangeable, stock power transmission equipment and parts.

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Hyman Mchy. Co.
WINSTON-SALEM, NORTH CAROLINA
Kester Machinery Co.
WORCESTER, MASSACHUSETTS
W.M. Steele Co.

*Branch office and stock

NAVY AWARDS

Bureau of Ordnance
Washington 25, D. C.

Clark Equipment Co., Buchanan, Mich.—tractors; fork trucks.

Brown & Sharpe Mfg. Co., Providence, R. I.—milling machine.

Buda Co., Harvey, Ill.—tractors.

Cincinnati Milling & Grinding Machines, Inc., Cincinnati—milling machines.

National Acme Co., Cleveland—trucking machines, hydraulic.

Geo. Gorton Machine Co., Racine, Wis.—engraving machines.

Machinery Associates, Inc., Philadelphia—drilling machines.

Jones & Lamson Machine Co., Springfield, Vt.—turret lathes.

Gleason Works, Rochester, N. Y.—bevel gear planer.

Fab-Weld Corp., Philadelphia—trailers, warehouses.

Packaging Industries, Ltd. Inc., Montclair, N. J.—portable sealers.

Dexter Folder Co., New York—folding machines.

Portable Electric Tools Inc., Chicago—portable drills.

Southbend Lathe Works, Southbend, Ind.—bench lathes.

Weaver Mfg. Co., Springfield, Ill.—hydraulic jacks.

Walker Mfg. Co., Racine, Wis.—hydraulic jacks.

Yale & Towne Mfg. Co., Philadelphia Div., Philadelphia—pallet trucks.

United Engineering & Foundry Co., Pittsburgh—motors, electric equipment, shears

Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.—boring machine; turning mill.

Bullard Co., Bridgeport, Conn.—boring mill, vertical.

E. W. Bliss Co., Canton, Ohio—keel bender.

Kearney & Trecker Corp., Milwaukee, Wis.—milling machine.

G. A. Gray Co., Cincinnati—boring, milling and drilling machine, open side planer, cylindrical grinder, hydraulic grinder, milling machines.

Lucas Machine Div., New Britain Machine Co., Cleveland—boring, drilling and milling machines.

Warner & Swasey Co., Cleveland—turret lathe, five spindles; turret lathe, saddle type.

Weston Electric Co., New York—erector magnetometer.

Gisholt Machine Co., Madison, Wis.—balancing machine.

Barnes & Reinecke Inc., Chicago—aeroballistics tunnel.

Chicago Pneumatic Tool Co., Philadelphia—pneumatic hammer, impact wrench.

Air Reduction Sales Co., New York—welding machines.

Wallace Supplies Mfg. Co., Chicago Bending Machines—pipe-bending machines.

Niles Toolworks Co., Div., Baldwin-Lima-Hamilton Corp., Hamilton, Ohio—lathes.

Milwaukee Electric Tool Corp., Milwaukee—portable drills.

United States Electrical Tool Co., Cincinnati—portable drills.

Tips Engine Works, Austin, Tex.—platform trucks.

Linde Air Products Co., Div. Union Carbide & Carbon Corp., Philadelphia—welding trucks.

R. K. LeBlond Machine Tool Co., Cincinnati—gap lathe.

Navy Purchasing Office
New York

Viewlex, Inc., Long Island City, N. Y.—remote control projector.

Presto Recording Corp., Hackensack, N. J.—spare parts.

General Electric Co., New York—electrical equipment, elevator.

Ships Parts Control Center
Mechanicsburg, Pa.

Bausch & Lomb Optical Co., Rochester, N. Y.—repair parts, navigational instrument.

Diehl Mfg. Co., Somerville, N. J.—electric motors, repair parts.

Ingersoll-Rand Co., Philadelphia—repair parts, pumps and compressors.

Robertshaw-Fulton Controls Co., Knoxville, Tenn.—temperature regulators repair parts.

Skinner Engine Co., Erie, Pa.—steam engine repair parts.

Dravo Corp., Philadelphia—auxiliary turbine reduction gear spare parts.

Westinghouse Electric Corp., Philadelphia—repair parts, electrical control equipment.

American Locomotive Co., Schenectady, N. Y.—repair parts, diesel engine.

Fairbanks, Morse & Co., New York—repair parts, diesel engine.

Worthington Pump & Machinery Corp., Harrison, N. J.—repair parts, pumps and air compressors.

Louis-Allis Co., Milwaukee—electric motors, repair parts.

General Electric Co., Philadelphia—repair parts, electrical control equipment; repair parts, turbines.

Naval Construction Battalion Center
Port Hueneme, Calif.

Edward D. Malthy Co., Inc., Los Angeles—spare parts.

Barber-Greene, Aurora, Ill.—ditching machine.

Galion Iron Works & Mfg. Co., Galion, Ohio—road grader and kit.

Muncie Gear Works, Inc., Muncie, Ind.—propelling unit.

Link-Belt Speeder Corp., Cedar Rapids, Ia.—crane components.

Weston Iron & Foundry Co., Wichita, Kan.—pile driver hammer.

Radio Television Supply Co., Los Angeles—public address system.

Foote Co. Inc., Nunda, N Y.—concrete mixer.

Victor Equipment Co., Los Angeles—arc welders.

Murray & Tregurtha, Inc., Quincy, Mass.—propelling units and parts.

Koehring Co., Milwaukee—spare parts, excavators.

Chain Belt Co., Milwaukee—concrete mixer.

Hatman-Dutton Co., Kalamazoo, Mich.—steam boilers.

Marion Power Shovel Co., Marion, Ohio—crane and attachments.

Baldwin-Lima-Hamilton Corp., Lima, Ohio—spare parts.

Pioneer Engineering Works, Minneapolis—crushing plant.

Great Lakes Steel Corp., Detroit—prefab buildings.

Sunset Electric Co., Seattle, Wash.—refrigerators.

Edward M. Ornitz & Co., Los Angeles—concrete mixer.

Apex Steel Corp., Ltd., Los Angeles—pile driver hammers.

Kwik Mix Co., Port Washington, Wis.—concrete mixer.

Bureau of Ships
Washington 25, D. C.

Telrex, Inc., Asbury Park, N. J.—antenna assemblies.

Engineering & Research Corp., Hyattsville, Md.—antennas.

Dinalabs Inc., New York—noise generators.

Collins Radio Co., Cedar Rapids, Ia.—master oscillator units, rectifier units, frequency shift gear units.

Cleveland Diesel Engine Div., GMC, Cleveland—diesel engines.

Photoswitch Marine Div. Inc., New York—salinity indicator panel.

Aurora Pump Co., New York—fresh water pumps.

Solar Aircraft Co., San Diego, Calif.—gas turbine pumps, portable.

General Electric Co., Washington—turbine blading sets.

Hardy-Tynes Mfg. Co., Birmingham, Ala.—air compressors, high pressure.

Ketay Mfg. Corp., New York—salinity indicator panels.

Hickok Electrical Instrument Co., Cleveland—tube tester, multimeters, electronic multimeters; oscillascopes.

United States Air Conditioning Corp., Minneapolis—centrifugal fan.

Hale Fire Pump Co., Conshohocken, Pa.—liquid proportioners.

Communications Co. Inc., Coral Gables, Fla.—radio receiving set.

Sierra Electronic Corp., San Carlos, Calif.—transmitting equipment.

Westinghouse Electric Corp., Washington—hoisting equipment.

Warren Steam Pump, Inc., New York—evaporator pumps.

C. G. S. Mfg. Co. Inc., Stamford, Conn.—electronic regenerative repeater.

Carl W. Schutter Mfg. Co., Lindenhurst, L. I., N. Y.—wave guide assembly.

Trad Television Corp., Asbury Park, N. J.—signal generator.

Times Facsimile Corp., New York, N. Y.—transmitters, facsimile.

Vickers, Inc., Vickers Electric Div., Washington, D. C.—motor generators.

Arma Corp., Brooklyn, N. Y.—dead reckoning tracer.

Clarage Fan Co., Kalamazoo, Mich.—centrifugal fans.

DeLaval Steam Turbine Co., Washington—lubricating pumps.

Ingersoll-Rand Co., Washington—main cargo pumps.

Worthington Pump & Machinery Corp., Harrison, N. J.—distiller pumps.

Raytheon Mfg. Co., Waltham, Mass.—transievers.

Bird Electronics Corp., Cleveland,—radio frequency watt meter.

Ward Electric Co., Mt. Vernon, N. Y.—battery charger.

L. J. Wing Mfg. Co., Linden, N. J.—vane axial fan.

Joy Mfg. Co., New Philadelphia, Ohio—vane axial fan.

General Communication Co. Inc., Boston—test sets.

Simpson Electric Co., Chicago—multimeters.

Stoddart Aircraft Radio Co., Hollywood, Calif.—test sets.

Hercules Motor Corp., Canton, Ohio—gasoline engines.

Willy Mfg. Co., Port Deposit, Md.—cargo barge.

Kelly Ryan Equipment Co., Blair, Nebr.—refrigerated cargo barge.

(Continued on page 201)

Ship Contracts Awarded

WASHINGTON—The Navy has awarded a $218-million contract for construction of a new large aircraft carrier to Newport News Shipbuilding & Drydock Co., Newport News, Va. Contracts for construction of two LST's have been given to Bath Iron Works, Bath, Me. Contracts for construction of 13 additional LST's in the 1952 shipbuilding program will be awarded by negotiation on a competitive basis.

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These 11 Chase warehouses do SLITTING

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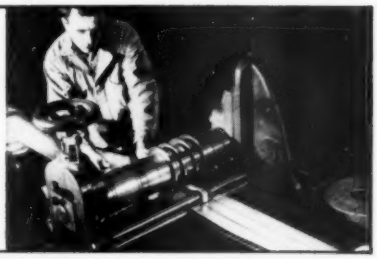

These 7 Chase warehouses do SHEARING

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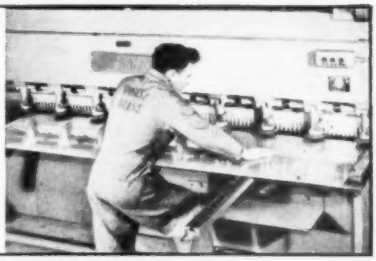
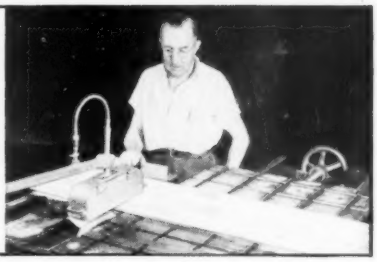
These warehouses also do slitting



These 4 Chase warehouses do SAWING

DETROIT
NEW YORK
NEWARK
CHICAGO

These warehouses also do slitting and shearing



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Boston	Detroit	Minneapolis	Providence	
Chicago	Houston†	Newark	Rochester†	(†sales offices only)
Cincinnati	Indianapolis	New Orleans	St. Louis	

BUREAU OF SHIPS ... continued

Farrel-Birmingham Co. Inc., Buffalo, N. Y.—hydraulic coupling, reverse gearing.

American Optical Co., Buffalo, N. Y.—projectors.

Henschel Corp., Amesbury, Mass.—transmitters.

Foster-Wheeler Corp., New York—economizer assemblies.

Camden Forge Co., Camden, N. J.—propeller tailshaft.

Falk Co., Milwaukee—reduction gears.

Buffalo Forge Co., Washington—vane axial fan.

Bettendorf Co., Bettendorf, Ia.—floats, cutters.

Astoria Marine Construction Co., Astoria, Ore.—mine sweeping diesel generator sets.

Teletype Corp., Chicago—teletype writer.

General Radio Co., Cambridge, Mass.—frequency meter.

Gould Pumps, Inc., Seneca Falls, N. Y.—condenser pumps, and bilge pumps.

Aurora Pump Co., New York—fresh water pumps.

Gow-Mac Instrument Co., Newark, N. J.—ventilating testing equipment.

Seaboard Electric Co., New York—audio frequency signal generator.

Stone Heating & Ventilating Co., Washington—centrifugal fan.

Consolidated Photo Engravers & Lithographers Equipment Co., Chicago—cameras.

American Phenolic Corp., Chicago—antennas.

Lavoie Laboratories, Inc., Morganville, N. J.—transmitting sets.

Detroit Basin, Inc., Detroit—prototype boat.

Wicks Engineering & Construction Co., Camden, N. J.—monitor group.

Buda Co., Harvey, Ill.—generator sets, diesel.

General Motors Corp., Detroit—diesel generator sets.

Martinolich Shipbuilding Co., San Diego, Calif.—mine sweepers.

Hogden Bros. Goudy & Stevens, East Bay, Maine—mine sweepers.

Pacific Boat Building Co., Tacoma, Wash.—mine sweepers.

NAVY AVIATION AWARDS

Aviation Supply Office, Philadelphia

Foote Bros. Gear & Machine Corp., Chicago—maintenance parts.

Bendix Products Div., Bendix Aviation Corp., South Bend, Ind.—maintenance parts; brake assembly; hydraulic cylinder, power boosters.

Action Mfg. Co., Philadelphia—aviation armament parts.

Aircraft Products Co., Clifton Heights, Pa.—cylinder assemblies, aviation armament.

Koehler Aircraft Products Co., Dayton, Ohio—valve strainer assemblies.

A. O. Smith Corp., Pacific Coast Div., Los Angeles—portable pumps submersible.

Hamilton Standard Propellers Div., United Aircraft Corp., East Hartford, Conn.—propellers.

Cox & Stevens Aircraft Corp., Mineola, L. I., N. Y.—aircraft weighing kit.

Mechanical Products, Inc., Jackson, Mich.—circuit breakers.

Tension Instrument Co., Long Island, N. Y.—filter and restrictors assembly.

Douglas Aircraft Co., Santa Monica, Calif.—shock absorber assembly, nose type.

Landers Frary & Clark, New Britain, Conn.—aviation armament parts, including gun heater.

Goodyear Tire & Rubber Co., Akron, Ohio—brake assembly.

Frieze Instrument Div., Bendix Aviation Corp., Baltimore, Md.—radio.

General Electric Co., Philadelphia—electric motors.

Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J.—maintenance parts instruments; transformer assembly; clutch pack.

Westinghouse Electric Corp., Philadelphia—maintenance parts, contractors, relays, generators, dampers, vibration.

Trane Co., LaCrosse, Wis.—steam traps, thermostatic.

Vickers, Inc., Detroit—spare parts, aviation armament.

Hazelton Electronic Corp., Little Neck, L. I., N. Y.,—spectro.

Thompson Products, Inc., Cleveland—maintenance parts, pumps.

Federal Mfg. & Engr. Corp., Brooklyn, N. Y.—signal generators.

Simmons Aerocessories, Inc., Tarrytown, N. Y.—fuse assemblies.

Hickok Electrical Instrument Co., Cleveland—testers.

Radio City Products Co. Inc., New York—voltmeters.

Cleveland Pneumatic Tool Co., Cleveland, Ohio—maintenance parts landing gear.

Columbus Engineering Co., Columbus, Ohio—spare parts.

Federal Enterprises, Inc., Chicago—parts, aviation armament.

O. E. Szekely & Associates, Philadelphia—maintenance parts, electric power plant.

Clayton Mfg. Co., Elmonte, Calif.—pressure cleaner.

Ann Arbor Railroad Co., St. Louis, Mo.—coal burning locomotive.

Cummins Engine Co., Columbus, Ind.—spare parts diesel engine.

Consolidated Machine Tool Corp., Rochester, N. Y.—engine lathes.

Kalamazoo Mfg. Co., Kalamazoo, Mich.—railway car maintenance.

American Hoist & Derrick Co., St. Paul, Minn.—spare parts, locomotive cranes.

Glenn L. Martin Co., Baltimore, Md.—maintenance spare parts.

National Instrument Laboratories, Washington—oxygen regulator.

American Air Motive Corp., Miami Springs, Fla.—maintenance parts, P&W engines.

Air Equipment Co., Burbank, Calif.—aviation armament parts.

Lockheed Aircraft Corp., Burbank, Calif.—maintenance parts.

Link Aviation Inc., Binghamton, N. Y.—spare parts, Link trainers.

Redco Tool Div., Red Lion & Cabinet Co., Red Lion, Pa.—oil circulator.

R. S. McMahon Co., Chicago—meat choppers.

AIR FORCE AWARDS

Air Materiel Command
Wright-Patterson AF Base, Dayton

Remington-Rand, Dayton—file cabinets.

Rheem Mfg. Co., New York—metal shipping containers.

Republic Aviation Corp., Farmingdale, L. I., N. Y.—sling assembly, hoisting fuselage, adaptor assembly, jacking fuselage, pass assembly; forged bulkheads, aircraft.

General Fireproofing Co., Youngstown, Ohio—steel desks.

Kindred Aviation Corp., Burbank, Calif.—cylinder stud assemblies.

Gisholt Machine Co., Madison, Wis.—dymetric balancing machine.

Bassons Industries Corp., Bronx, N. Y.—modification kits.

Packard Will Need Suppliers

DETROIT—Approximately 2500 suppliers will be required by Packard Motor Car Co. when its jet engine and marine diesel engine production programs get under way along with its automobile output. Ordinarily about 1100 serve the company's automobile requirements.

Federal Motor Truck Co., Detroit—spare parts, truck tractor.

Lanigan & Hoke, Philadelphia—ignition and accessories cables.

Electric Autolite Co., Toledo—spare parts, fuel servicing trailers.

United Truck & Equipment Co., Baltimore, Md.,—jack assemblies.

Knox Metal Products, Inc., Waynesboro, Ga.—utility-type trailers.

Spencer-Turbine Co., Washington—vacuum cleaners.

Safeway Steel Products Co., Milwaukee—portable engine hoists.

Singer Sewing Machine Co., New York—sewing machines.

Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J.—generators, blowers assembly; maintenance parts, accelorometer; torque pressure indicator; fuel flow transmitters and indicators; starters; automatic pilots; amplifiers, compass signals.

Servo Mechanisms, Inc., Mineola, N. Y.—air speed indicators, mach number computers and indicators.

Wysong & Miles Co., Greensborough, N. C.—squaring shears.

Underwood Corp., Dayton—typewriters.

Royal Typewriting Co., Dayton—typewriters.

Burroughs Adding Machine Co., Dayton—check-writing machine.

International Postal Supply Co., Brooklyn, N. Y.—check-signing machines.

Shaw-Walker Co., Dayton—filing cabinets.

L. C. Smith & Corona Typewriters, Inc., Dayton—typewriters.

Propeller Div., Curtiss-Wright Corp., Caldwell, N. J.—machinery and equipment.

Vinco Corp., Detroit—machinery and equipment.

Philadelphia Metal Warehouse Co., Philadelphia—aircraft instruments.

Globe Aircraft Specialties, Inc., Mineola, L. I., N. Y.—aircraft parts.

Dumont Aviation Associates, Long Beach, Calif.—commercial hardware.

Lake Erie Engineering Corp., Buffalo, N. Y.—machine tools.

Manufacturers' Representatives, Inc., Chicago—commercial hardware.

Cherry Rivet Co., Los Angeles, Calif.—pneumatic riveting guns.

Valcrank, Inc., Cincinnati—fabricator.

Instruments Associates, Great Neck, N. Y.—oxygen flow indicator.

American Gas Accumulator Co., Elizabeth, N. J.—transformers.

DoAll Cincinnati Co., Cincinnati—contour sawing machines.

Westinghouse Electric Corp., Dayton, Ohio—aircraft hardware.

Dzus Fastener Co., Inc., Babelon, N. Y.—aircraft hardware.

Joleco Corp., St. Louis—indicators.

Trailmobile Co., Cincinnati—trailer spare parts.

DeWalt, Inc., Lancaster, Pa.—straight line cutoff saw.

Columbia Machinery & Engineering Corp., Hamilton, Ohio—squaring shears.

F. E. Worch Machinery Co., Columbus, Ohio—squaring shears.

Buescher Band Instrument Co., Elkhart, Ind.—cabin pressure indicators.

Garrett Corp., Los Angeles, Calif.—turbine assembly.

Phaostron Co., South Pasadena, Calif.—generator, field controlled relays.

Varo Mfg. Co., Garland, Texas—static converters.

Bendix Radio Div., Bendix Aviation Corp., Baltimore, Md.—relay assemblies; indicators.

Kollsman Instrument Corp., Elmhurst, N. Y.—air-speed indicators.

Square D Co., Elmhurst, N. J.—multi-purpose pressure indicator.

Hartman Electrical Mfg. Co., Mansfield, Ohio—over-voltage relays.

Westinghouse Electric Corp., Dayton, Ohio—alternators.

(Continued next page)

Follow this section each issue for news about

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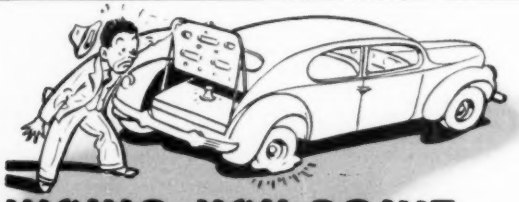
All the news to help you in subcontracting problems.



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AIR FORCE AWARDS . . . continued

General Electric Co., Schenectady, N. Y.—modification kits; radar set components; radar parts, spare parts; turbo superchargers; switching units; regulators.

Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.—auto pilot, control components.

Oiken Research Corp., New York—rockets.

Jack & Heintz Precision Industries, Cleveland—aircraft generators; starters; gyro horizon indicators.

Boeing Airplane Co., Seattle, Wash.—fuel quantity gages; frequency meter kits.

Lockheed Aircraft Corp., Burbank, Calif.—mobile training units.

Works Engineering & Construction Co., Camden, N. J.—control tower.

RCA-Victor Div., Radio Corp. of America, Camden, N. J.—radar sets.

Pesco Products Div., Borg-Warner Corp., Bedford, Ohio—aircraft maintenance parts; fuel booster pumps.

Packard Motor Car Co., Detroit—turbo-jet aircraft engines.

Daystrom Electric Corp., Poughkeepsie, N. Y.—recorder reproducer.

Lewison Engineering Co., Naugatuck, Conn.—temperature indicators.

Studebaker Corp., South Bend, Ind.—turbo-jet engines.

Canadian Commercial Corp., Washington—magnetos, miscellaneous spare parts.

Sylvania Electric Products, Inc., Buffalo, N. Y.—transmitters.

Fairchild Camera & Instrument Corp., Jamaica, L. I., N. Y.—radio compass components.

Magnavox Co., Fort Wayne, Ind.—indicators.

Sperry Gyroscope Co., Div. Sperry Corp., Great Neck, L. I., N. Y.—compass systems.

North American Aviation, Inc., Los Angeles,—manufacturer of aircraft; aircraft kits; armament kits.

Curtiss-Wright Corp., Propeller Div., Caldwell, N. J.—spare parts, propeller; kit assemblies.

Ford Instrument Co., Long Island, N. Y.—generators.

Shure Bros. Inc., Chicago—microphones.

Schuttig & Co., Washington, D. C.—receiving equipment.

Hoffman Radio Corp., Los Angeles—radio receiver transmitter.

Continental Electronic Ltd., Brooklyn—relays.

Spencer-Lycoming Div., Avco Corp., Stratford, Conn.—engines.

Consolidated Vultee Aircraft Corp., Burbank, Calif.—fabricated parts.

Continental Motors Corp., Muskegan, Mich.—spare parts, engine.

Wright Aeronautical Co., Woodbridge, N. J.—engines, spare parts.

Radio Co., Van Nuys, Calif.—auto pilot control boxes.

Ryan Aeronautical Co., San Diego, Calif.—cavity containers.

Rhodes-Lewis Co., Culver City, Calif.—automatic gun chargers, spare parts.

Bendix Aviation Corp., South Bend—carburetor assembly; fuel injection system.

Hyatt Products Co. Inc., Belleville, N. J.—antennas.

Boonton Radio Corp., Boonton, N. J.—signal generators.

Collins Radio Co., Cedar Rapids, Ia.—modulators.

Harvey Wells Electronics, Inc., South Bridge, Mass.—radar oscillator.

Western Gear Works, Lynnwood, Calif.—spare parts.

Walter Kidde & Co., Belleville, N. J.—pneumatic valves.

Specialties, Inc., Syosset, L. I., N. Y.—spare parts.

Freed Transformer Co., Brooklyn, N. Y.—transformers.

Aero Research Mfg. Co., Garrett Corp., Los Angeles—actuators.

Weston Electric Co., New York—pulse former net works.

Transducer Corp., Boston—spare parts, trainers.

American LaFrance Foamite Corp., Elmira, N. Y.—crash fire trucks, spare parts.

Texas Tool Traders, Dallas—pneumatic hammers.

Accurate Parts Mfg. Co., Cleveland—clutch rebuilder.

Baldwin Co., Cincinnati—pulse analyzers.

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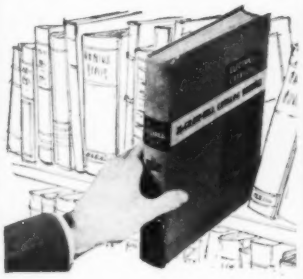

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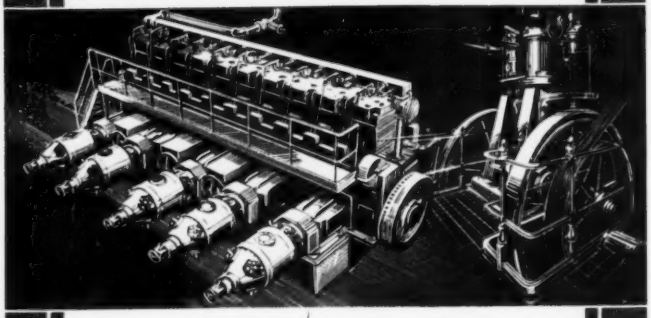
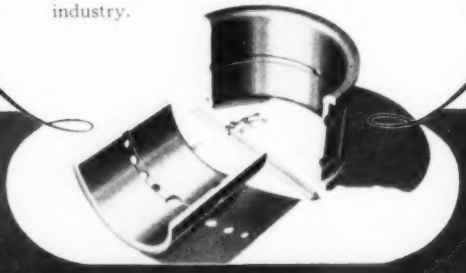


Progress in Diesels Required Progress in Bearings

CLOSE cooperation on design has been carried on for years by Johnson Bronze and diesel manufacturers. The tremendous advancement in diesels since 1901 and the need for wider application of diesel power has required much research and study of sleeve bearing materials and design. Load, shock, speed, temperatures, corrosive conditions and other service considerations have been studied thoroughly by Johnson engineers. This close relationship has resulted in today's efficiency and dependability in Johnson Sleeve Bearings for the diesel industry.



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on a new generator the first time it turns over—so why throw the works at a new man.

Getting closer to home, many shops on mass production always run new machine tools in a test bay for a period of time before setting them in the line. Of course this isn't always possible. Many plants have only the space on the floor where the machine must operate but they don't expect (or shouldn't) department percent performance in the first shift.

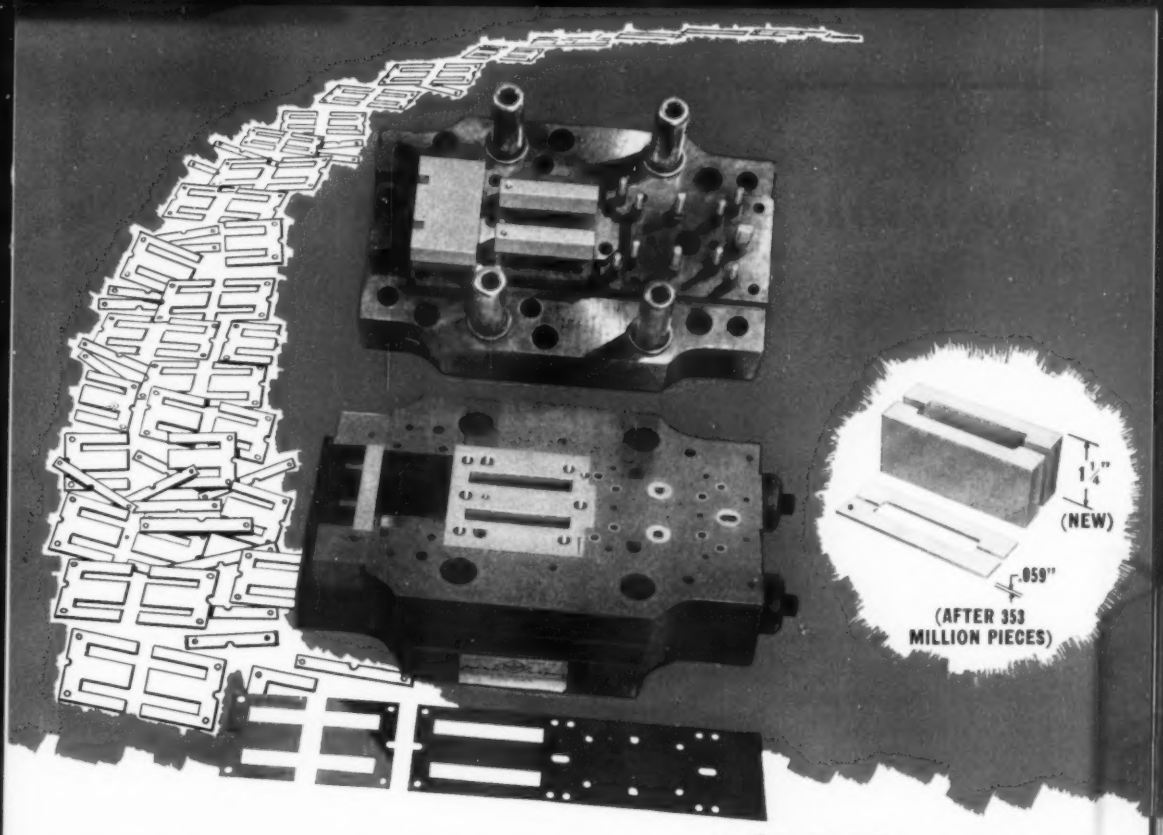
You can find out what the new man can do just as easily on a run-of-the-shop job where he can at least have time to get squared away at his machine, learn East from West and whether to turn right or left for the washroom. It isn't necessary either to insult his intelligence by giving him chisel blanks to turn. Even this would show more horse sense though, than to lead him up to the machine, hand him a drawing, a hunk of metal and then introduce him to the department chaser who'll take the work as soon as he finished with it and "run it over the next operation." Migawd, Ed, just how stupid can you get?

Austin M. Elliott
Lockport, N. Y.

•

SHOULD one start a new man out with an easy job or a tough one? When a new man enters the shop for the first time he is practically lost. Judging from his nervousness his blood pressure should be very high Often he suffers goosepimple aggravatus. He faces an unknown foreman who may be a human being or a Simon Legree. The poor sucker is scared that he will not last till five o'clock. The personnel department has asked him so many irrelevant questions that he doesn't know if he is coming or going. How could anyone be justified in starting him out with anything but an easy job until the tender-hearted soul gets acquainted with some of the men and gets to know the feel of the machines around the shop? If he is given a tough assignment right as a start, the chances are that he will muddle it through or else he will wreck something.

Was Ed's action justified? Decidedly no. His action indicates a complete lack of psychological training. The man should have been given an easier job 'till he had gotten warmed to the shop temperature and then, as time progressed, he could have been given jobs of advancing difficulty. This seems like babying a man along but it's profit-



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. . . to controlled burr limits with Diecarb

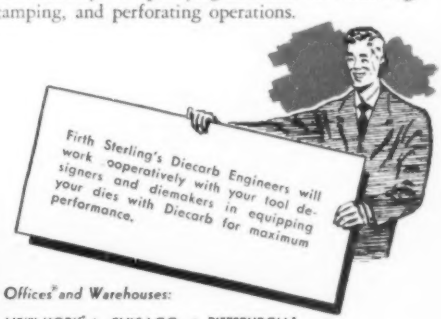
Press—Henry & Wright Dieing Machine operating at 300 strokes per minute, 4 blanks per stroke (2 "E" sections, 2 "I" sections.)

	Steel Die Sections	Diecarb Sections
Pieces per grind (av.) . . .	300,000	2,800,000
Pieces per life of die . . .	20,000,000	353,024,000

Production efficiency increased 50% due to reduced downtime.

Die costs Performance Ratio—1400% production increase with Diecarb Die and only 82% die cost increase; producing flatter, strain free blanks with less burr.

Blanking .014 and .025 silicon steel transformer core laminations is a tough assignment for any die . . . except the die equipped with Diecarb sections. Performance comparisons prove conclusively the wisdom and economy of specifying Diecarb for blanking, stamping, and perforating operations.


Firth Sterling's Diecarb Engineers will work cooperatively with your tool designers and diemakers in equipping your dies with Diecarb for maximum performance.

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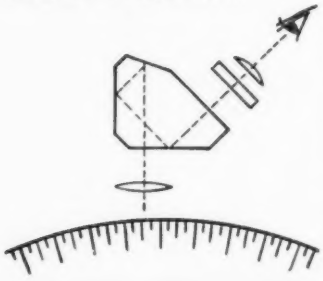

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. . . permits reproducible accuracy within .0005 inches on the periphery of a 12 inch circle. The setting is entirely independent of gears with their inherent inaccuracies. You read degrees, minutes and seconds directly; no tabular references are required. There are no index plates, no setting holes to locate.

Increase both accuracy and speed of indexing on your machine tools. Investigate OPL Dividing Heads.

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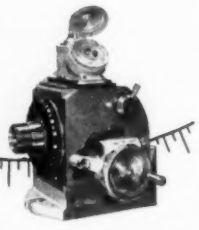

F. T. GRISWOLD MFG. CO.
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Griswold
OPTICAL POSITIONING

able—both for the man and the firm. It is important that the foreman know as much about the new man in as little time as is practically possible. Nothing is to be gained in crowding an unknown.

Do shop men expect such summary treatment? I am going to take two extremes. Somewhere between these is the ideal. We have the worker who is so packed with ego that he would resent being considered an untried addition to the shop. He is always eager to step out regardless of the consequences. He's the sure-I'll-do-it-come-hell-or-high-water kind. The self-propelled go-getter is so case hardened from jumping from shop to shop that he'd tackle anything from running the place to wrestling with a panther. He'll probably get the job out on time, without a flaw in it, and then ask for his time so that he can get on to another town. It is hard to say whether this fellow is of any value or not in spite of his ability and adaptability.

In contrast to him, we have the other type, the milquetoast breed who progresses with extreme care and analytical deliberation. He doesn't like to push himself; he's polite and considerate of the other fellow's feelings. Whereas he would find his way around eventually the go-getter would accomplish his mission by slapping a perfect stranger on the back and asking. He is the dependable type who after running the gauntlet for several weeks turns out to be a valuable and dependable man. The best way to heat a piece of steel is to let it soak; you can't force it and expect good results.

Jack Everett
San Francisco, Calif.

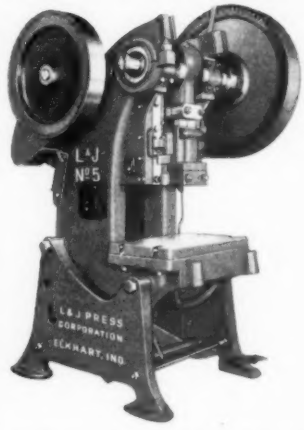
•

THE FIRST DAY a new employee starts at a bank, he is not given the combination of the safe or allowed to handle great sums of money. He might have the best references in the world but he has to work his way before given full responsibility. This same procedure must be followed in the shop. A new man should be given time to adjust himself before he is given a tough job or is entrusted with expensive or delicate tools and equipment.

No matter how much experience a man has, he still has stage fright on his first day in a strange plant. He can muff a simple job on the first day due to his excitement. If the foreman thinks he can judge a man by his first day's work, he is going to lose a lot of good men.

Many men have told me that they

L&J PRESSES
Rigid—Dependable



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No. 5 Back Geared Press (illustrated above)
50 ton capacity, 4" standard stroke, 45 strokes per minute, 10¼" or 15¼" die space (bed to slide, stroke down, adjustment up).

No. 1 PRESS
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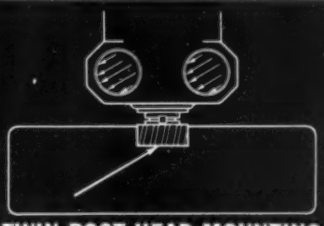

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Head mounted on two cylindrical ground steel posts which carry spindle midway between them—an *exclusive Kent-Owens feature!* No overhang.

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Hydraulic feed used on all Kent-Owens power feed machines. Wide range of automatic cycles available including intermittent milling, etc. Independent feed rate for both directions of table travel permits doing entirely different operations at opposite ends of table.

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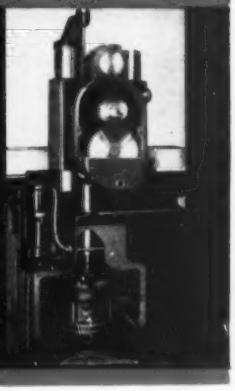
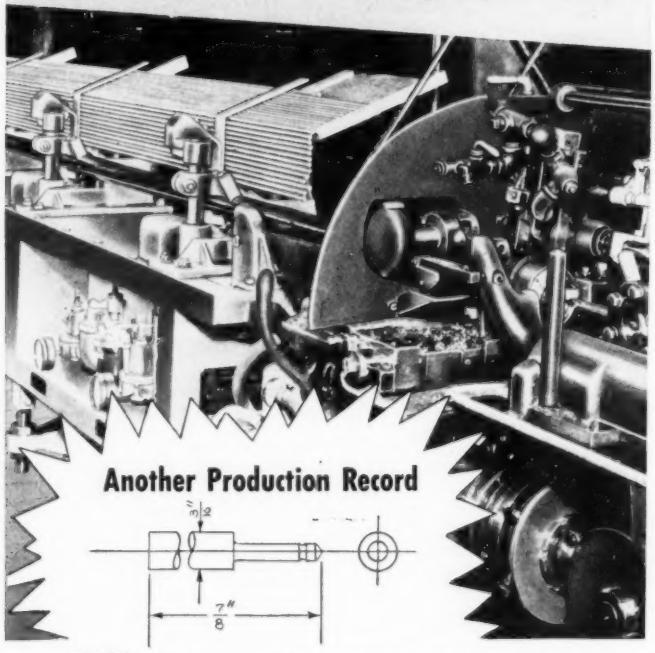
Drive is unusually simple and direct, being taken from a standard foot mounted ball bearing motor at rear of machine. Wide range of spindle speeds by changing pick-off gears.



Lipe Automatic Magazine-Loading BAR FEED

Increases Production 78% ...Eliminates Helper



Another Production Record

THE JOB— One operator attended four screw machines. One of these machines made the part shown above. Average production: 9,000 pieces per 10-hour day. To avoid "cutting air" and to step-up production, a helper was employed to assist operator to keep all four machines loaded. With the extra man, output was raised to approximately 12,000 pieces per day on the unit assigned to this particular job.

THE IMPROVEMENT— Lipe Automatic Magazine Loading Bar Feed was installed on this one machine. Then, operator was able to attend all four units . . . no helper any longer necessary! And the Lipe-equipped machine averaged 16,000 pieces per day — 78% more than original output!

THE LESSON— Lipe Automatic Bar Feeds *greatly increase production — even over closely supervised, hand-loading methods.*

BIG Production Gains on a wide variety of work, BECAUSE—

- Stock is fed to screw machine all the time—not dependent on operator.
- Pressure constantly behind stock.
- Eliminates feed fingers.
- Avoids multiple feed finger feed-outs.
- Model AML gives maximum output of machine—no "cutting air".
- Saves in changeover set-up time.

Get full details on how this machine will increase production and save you money. It's today's big advancement in screw machine stock feeding. Our engineers will gladly study your problem . . . no obligation.

Lipe - ROLLWAY CORPORATION
Manufacturers of Automotive Clutches and Machine Tools
Syracuse 1, N. Y.

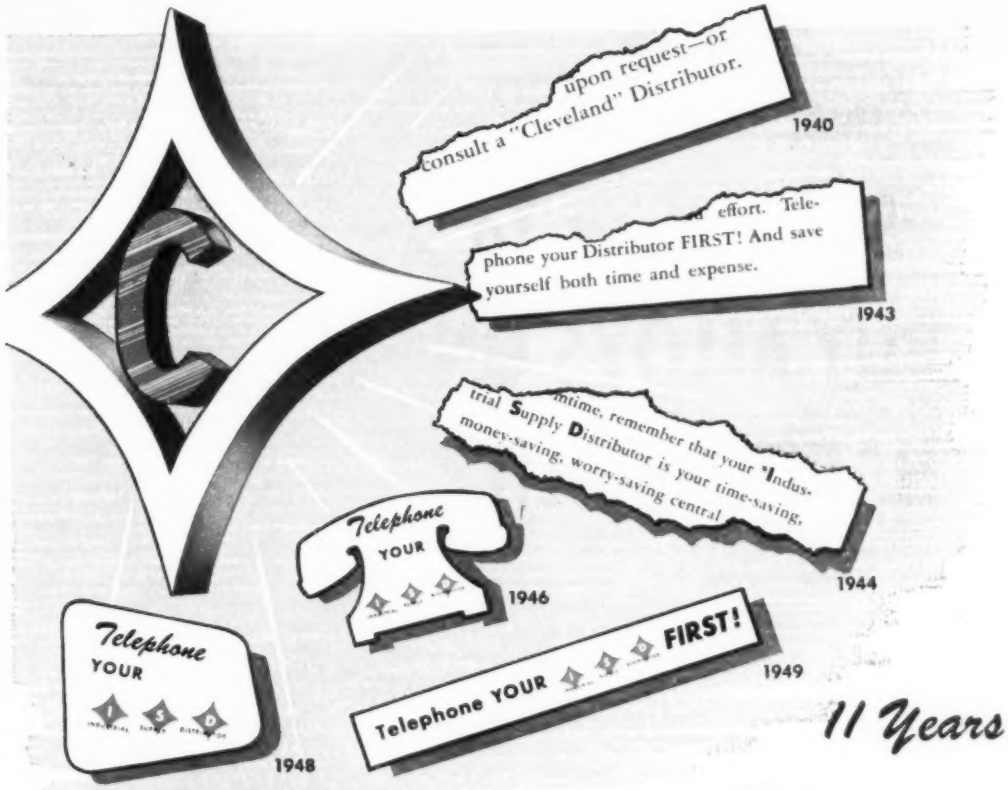
walked out of the shop on their first day because the foreman threw the toughest job in the shop at them and walked away. Sometimes a new man can fool the foreman by doing a first-class job the first day to make an impression and then turn out to be no better than a mediocre mechanic. In many plants, a new employee is considered temporary until he has worked sixty or ninety days. It is assumed that in this length of time the foreman can decide whether to accept the man as a permanent employee or let him go on his way. The foreman should take advantage of this probational period and give a man a chance to prove his worth. It shouldn't take him more than thirty days to decide how well the new employee fits into the organization. Both parties are satisfied at the end of the period, the employee knows he was given a fair opportunity and the foreman knows whether he can trust the man or how much work he can expect from him.

Frank J. Zarnowski
Rutherford, N. J.

•

IN STARTING a new man on the job, it would be well if the foreman kept in mind the old adage: "Well begun is half done." One of the most trying and difficult day in any person's life is often the first day on a new job. Everything is new and unusual. There is bound to be a certain tension and apprehension. Many questions assail the new employee's mind, some petty or inconsequential which will be answered automatically, others extremely important. If the foreman is cooperative and intelligent in his treatment of the new employee the job of successfully orienting him to his new job is well begun, and efficient production is assured. Good foremen recognize these first-day difficulties and many have worked out more or less comprehensive plans to acquaint the new employee with the organization, the work, and his responsibility to the company.

The more ambitious and anxious to please an employee is, the more likely he is to be nervous on a new job. This is especially true of beginners. The careless, happy-go-lucky employee who is never going to assume responsibility, lets the employer worry. The earnest, ambitious, conscientious employee may worry himself almost to the point of illness about getting started. The fact that the heaviest rate of turnover is among new employees suggests that anything which can be



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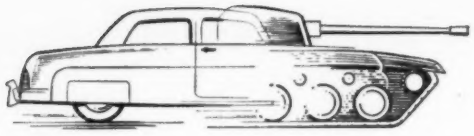

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Not every company makes these tests, records this information, but Ryerson does—and at no extra cost to you. It's all part of a service system called the Ryerson Certified Steel Plan. So during this confusing period, order by AISI and SAE number if you wish but also specify hardenability and be doubly sure. Though some shortages are inevitable, we will do our level best to supply the alloy steel you need.

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done to get the new employee started off on the right foot, and to make him feel he has a good job, is found to be reflected in a reduced "quit rate" for the plant.

The problem presented in the discussion on how a new man should be started; with an easy job or a tough one, is a matter for the foreman to determine in his work assignment method. Certainly, common sense dictates starting a new man off with an easy job and assigning more difficult ones as his experience and ability increases.

The capable foreman knows from experience that in the matter of tools for the new man, it is foolhardy to entrust a valuable tool to an untried man. A new man always is anxious to make a good showing and in so doing is liable to damage an expensive tool to get the work out in a hurry. The foreman should allow enough of a probationary period to appraise the new man's worth properly. In any event, the new man should not be dismissed for breaking an expensive tool where insufficient instruction and preliminary training was given by the foreman.

Someone must decide where and how to put the new employee to work. If hired for a specific job in which the new employee has had pervious experience, the problem is fairly simple. But even where an experienced worker is hired it must be remembered that methods differ in ever yshop. Whoever introduces the new employee to the foreman should explain something about the previous experience or skills possessed by the newcomer, so that the person in charge can place the new worker to best advantage. Can the newcomer step into the work and carry on without special instruction?

"Please don't treat them as you would your own—but as you would mine!"

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Type N ROTO-CLONES exhausting grinding and buffing operations.

ROTO-CLONES

control grinding and buffing dust!

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The Type N ROTO-CLONE is a dynamic precipitator of the hydro-static type. It exhausts, collects and stores dust . . . in the form of sludge . . . within one compact, self-contained unit. High efficiency dust and fume removal is obtained by the Type N's dual washing and scrubbing action. This removes both coarse material and extreme fines from the air stream, even in excessive concentrations. Water curtains induced by air flow eliminate pumps, nozzles and all moving parts.

The Type N ROTO-CLONE maintains peak efficiency without interruptions for reconditioning or service. Also uniform air delivery assures sufficient air flow at hoods and unvarying velocities in branch pipes and main ducts at all times.

The complete line of AAF ROTO-CLONES offers a wide selection of performance and operating characteristics that will efficiently control every dust source. For the correct solution to your dust or air pollution problem call your nearby AAF representative or write direct to us.

**ROTO-CLONE is the trade-mark (Reg. U.S. Pat. Off.) of the American Air Filter Company, Inc., for various dust collectors of the dynamic precipitator and hydro-static precipitator types.*

AAF American Air Filter COMPANY, INC.

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Does he understand company quality standards? Should the new man be put on simple work at first as a test of ability and speed? How does the new work differ from the work the employee has done in the past? What production is expected of newcomers? In other words, the new employee should have some idea of what is expected in the way of quality, speed, and performance. The proper source for these answers is the man's foreman. He is the logical instructor in correct procedures for the new man.

In all work assignments where machines are involved, prevention of damage to the machine as well as safety hazards should be fully explained by the foreman to the man.

If the new employee gets off on the wrong foot in his early critical days with the company, immeasurable harm may be done. Some old-time foreman may object to this and dub it a mollycoddle attitude toward new workers. Actually, it is nothing of the kind. The best foremen have gone to great lengths for many years to start the new employee out right.

New employees must be informed about plant rules and policies.

It takes time and effort to properly appraise a new man's worth to the company. If the proper ingredients are put into the effort, a good worker will be added to the company's assets. The results of an effective orientation program pay off in lower production costs and higher quality. Training in the proper use of equipment and tools assures their longer life and lower expense.

For effective handling of the new worker, the foreman should remember the old adage:

"He that climbs a ladder must begin at the first rung."

Harry Kaufman
Philadelphia, Pa.

•

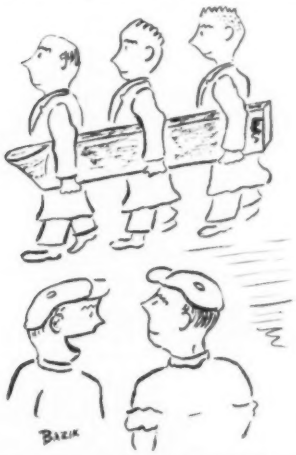
ACCURACY in analyzing probable weak points of a new man is greatly enhanced if a foreman will take time to talk with him before putting him on a job where expensive equipment is liable to be broken or damaged. If Ed were honest, he would straightway admit he might face some difficulty himself if he were suddenly ushered into a strange shop where the boss put the "heat" on him. Al is correct in his idea that any new employee is entitled to a probationary period while getting the feel of his new job. The firm is also entitled to the same thing, for any company suffers loss when good men are not given a proper chance.

Preliminary appraisal of a man's

probable aptitude for a given type of work can be made through verbal examination, asking him a few questions touching on his former employment, whether he has done this and whether he has done that. If it is discovered that he does not have required experience and ability, procedure may be based on starting him on easier work until he has opportunity to acquire what he lacks. In a remarkably high number of cases, men with wide experience still do not have the particular bit of experience needed to make a really good showing on the first job assigned to them.

A highly unfortunate aspect of industrial organization is that many incompetent men are in a position to hide one serious mistake after another, while a newcomer has little or no opportunity for a really fair break. Industrial history abounds with instances in which men have been unfairly discharged because they had a run of bad luck. Were it possible to plainly set out on a chart the actual competency of each man in the average department, there would be many surprises.

There are cases in modern industry where supervisors go to much greater length than even Al suggests to put new men at ease, to assign them to simpler jobs, and to be certain they understand what they are doing before they are allowed to cut loose and go it alone. Some tell a man how, then proceeed to show him how while telling him again, then finally require the man to tell them how. Then, while the new man is telling and showing his foreman how, the foreman may quietly interrupt with questions, asking him why



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DETROIT POWER SCREWDRIVERS

3 SIZES to drive screws from No. 2 to ¼". Model A pictured. Capacity No. 2 to No. 6 screws.

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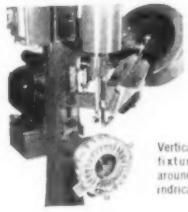
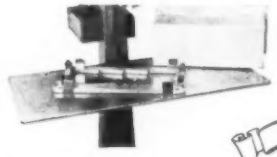


Vertical type, manually operated fixture assembling screws around outer periphery of cylindrical die casting.



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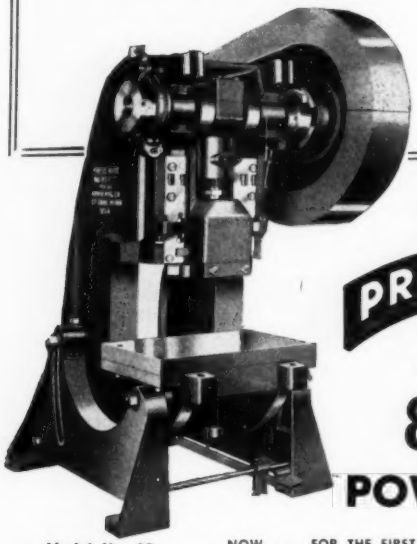


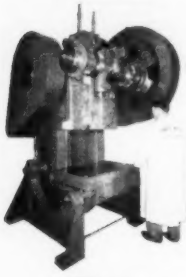
WITH OUR

PRESS-RITE

Open Back
—Inclinable

85 TON POWER PRESS

Model No. 85



Model No. 85
Back-Geared

NOW . . . FOR THE FIRST TIME . . . the famous Press-Rite No. 85 is available with a smooth-operating, power-conserving Air Friction Clutch . . . plus the positive safeguard of a spring-applied brake. Thus we have added to the many proven advantages of this Press-Rite giant—Built-In Tie Rod Frame, Triple Ramway Lubrication, extra heavy construction throughout — the simplest, safest, most durable and most efficient clutch-brake arrangement ever introduced into the power press field!

ENGINEERED FOR SAFE OPERATION—The new Press-Rite Air Friction Clutch goes a long way toward eliminating damage to dies or to the press . . . while providing maximum protection against injury to the operator. The clutch and brake cannot be engaged simultaneously—when the clutch is engaged, the brake is instantly released, and vice versa. If air supply or electric power fails, the clutch releases and the brake immediately stops the ram. Clutch gripping pressure can be regulated to suit the operation, thus avoiding damage to jammed dies or to the press.

CLUTCH-BRAKE MAINTENANCE PRACTICALLY ELIMINATED—The design of the new Air Friction Clutch virtually limits wear to brake and clutch linings. Seal-packed flywheel bearings, inter-locking Clutch-Brake arrangement—these factors permit operation for years, with neither repair nor adjustment.

FOR STAMPING, BLANKING, DRAWING, FORMING and PUNCHING . . . there's a Press-Rite that's right for you. Seven models available . . . capacities 5 to 85 tons.

WRITE FOR FULL INFORMATION, TODAY!

Sales Service Machine Tool Co.

PRESS-RITE PRESSES · SHEAR-RITE SHAPERS · KELLER POWER HACK SAWS

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ST. PAUL 4, MINNESOTA

he does a certain thing, or why he proceeds as he does, to be certain he understands.

In such a process, a foreman may discover the man has a good basic understanding, but that he would normally proceed along a different line used where he was formerly employed. Then he may be told, "Here, we do it this way instead, and this is the reason." Or, "Here, we do it this way, and though it may not be any better than what you have been accustomed to doing, yet it is a method we have long followed and are accustomed to. You will be expected to do it our way, unless and until we see the advisability of making a change in our normal shop procedure."

It doesn't take too long to discover what is in a man, even though he is started on a mild and considerate basis, for that is a relative procedure, gauging the new man against others in the shop after he has had opportunity to become acclimated. Any foreman who hands a new man the toughest job available, lets him go it alone and then fires him for a mistake, may well be suspected of a carnal desire to make a cheap show of his authority.

John E. Hyler
Peoria, Ill.

•

THE HIRING of a man of unknown skill and ability involves a certain amount of risk. While the great majority of them are bona fide, occasionally one will show up that makes any formeman discouraged.

It is only natural that the shop leader should make an effort to determine the status of the new man as quickly as possible but all too often he fails to consider that a starter should be exposed gradually to perform at his best. You'll often find the individual who adapts himself to new surroundings with lightning-like rapidity—one of those enigmas who could be dropped into a pool of ice water and swim around with complete unconcern. Invariably the worker is bent upon establishing a good showing as soon as possible.

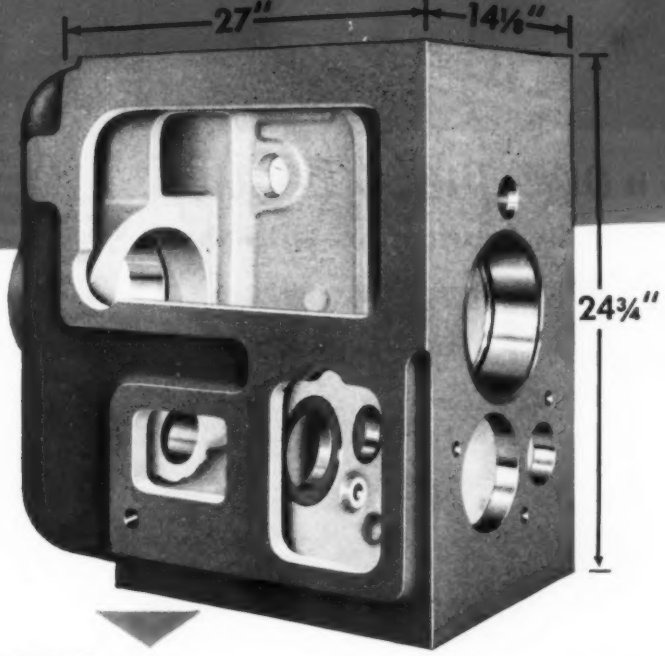
The foreman should urge him to go slow until he became acquainted with things about the shop. Then the man can in time do justice to himself as well as the firm. A new employee can put on a pretty good front while applying for a job and, if he is traveling under false colors, can pull some silly stunt that would be very costly. Often the boss will place too much confidence in the unknown member of his crew with the result that something of value is ruined.

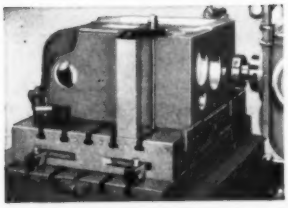
THE "JIGMIL TECHNIQUE" MAKES

JIGLESS BORING

possible on small lot production

- FAST PRODUCTION AND HIGH ACCURACY
- FLEXIBILITY OF APPLICATION FOR SMALL LOT PRODUCTION
- SUBSTANTIAL REDUCTION OF TOOLING COSTS





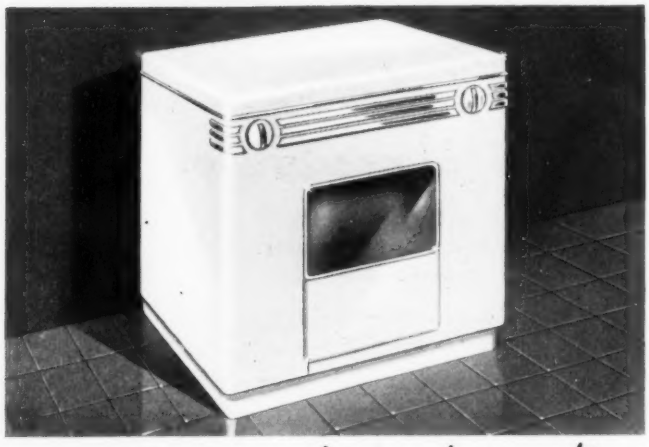
This casting is processed in lots of 12 on a Model 3B Jigmil. "In Line" Bores are machined with simple Stub Boring Bars to Precise Limits of Alignment by Indexing Workpiece 180°.

Come to Detroit and Investigate the "Jigmil Technique"

Demonstrations at our Plant by Appointment

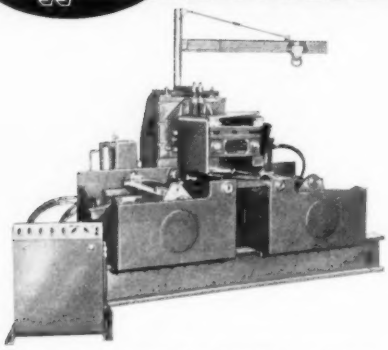
DEVLIEG MACHINE CO. DEVLIEG JIGMIL 450 FAIR AVE. FERNDALE 20 (DETROIT) MICH.

Your *dryer* competes on appearance too!



Give it *one-piece beauty* and save in fabrication with the

Struthers Wells TANGENT BENDER



Quick, slick one-operation bending makes a wrap-around *for less* . . . when the Struthers Wells Tangent Bender goes to work for you!

You can design top-flight, streamlined beauty into your dryers and other appliances without a cost penalty in production, because the Tangent Bender handles radial edge bends of flanges, corner bends of any radius, and crowns, *fast and easily with less handling.*

Let us meet for a factual discussion!

STRUTHERS WELLS *Corporation*

***Machinery Division:* TITUSVILLE, PENNA.**

The pathetic case is where a genuine mechanic meets up with misfortune on his very first job and, through the foreman's erratic appraisal of his true worth, he is booted with ignominous dispatch to the unsympathetic street below.

I know of a first-class toolmaker who had worked for me for two years. To me he was worth two other men, he knew the value of accuracy and he also knew where to cut corners to save time. This fellow met with hard luck on his first day on his new job, after leaving our shop, and was fired so fast that it pretty nearly broke the poor fellow's heart.

No, Ed, you have showed good judgment at times but you made a great mistake in letting the new man go, you are the one who made the error. Where you made the greatest mistake was in giving an unknown a job in which there was danger of a valuable tool being damaged. There are many jobs that can be given to new employees during the breaking-in period in order that you may determine his worth. One of my favorite jobs, that I considered as being suitable for determining the effectiveness of one who claimed that he was a good lathe hand, was to make a new chuck back. After telling the man that I wanted a good fit I left him alone until he was finished with the job, then I'd look it over. To some, this may seem like a tough assignment for a beginner but I usually gave the uninitiated all the time he needed to do a first class job. There is possibility of a fellow running into some hard luck, being new on the job and tightened up with that first day feeling, but if he should ruin the job one could affirm his self-esteem by letting him do another.

It boils itself down to the fact that time and patience is necessary to properly evaluate the worth of a new man.

John Homewood
Ontario, Calif.

NEW BOOKS

NEW LESSONS IN ARC WELDING. *Published by The Lincoln Electric Co., Celeveland, Ohio. 320 pages. Price $1.00 in USA, $1.50 elsewhere.*

Based on the lessons and instructions given at the Lincoln Arc Welding School, this new book presents, in an entirely practical way, the fundamentals of arc welding, as well as

ASK

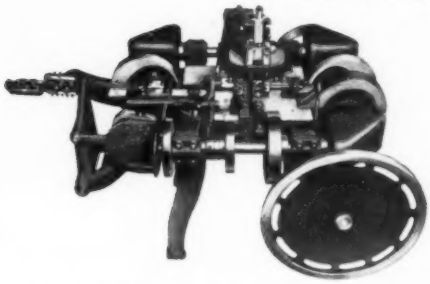
BAIRD

ABOUT IT!

HIGH PRODUCTION TOOLING

FOUR BASIC HIGH PRODUCTION UNITS

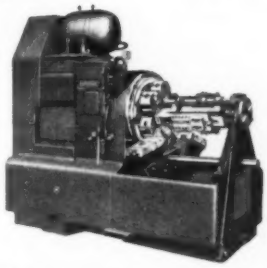
invaluable to Prime and Subcontractors



The four Baird machines shown on this page have been time-tested in many of the leading industrial plants of this and other countries. Their high speeds, multiple production features, and wide variety of tooling possibilities spell cost reductions thru high production and man-power savings. Automatic operation, wherever possible, has been designed into each unit as well as provisions to facilitate fast set-up. Check each machine . . . then . . . "ask Baird about it".

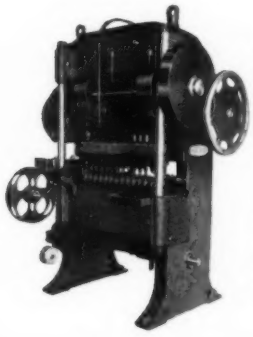
BAIRD 4 SLIDE MACHINE

The FOUR SLIDE (above) is a basic design machine . . . stocked and tooled to your specific requirements for repetitive production of wire forms and coiled stock work . . . almost unlimited in scope. Operation entirely automatic. Eight standard sizes cover wire diameters 1/32" to 1/2" and ribbon widths 3/16" to 1-3/8" . . . larger capacities on special order. You will find extra profits on your cost sheets with this machine in your plant.



BAIRD 76H CHUCKER

Completely automatic with 5 longitudinal and 5 cross slides, open construction for easy access to all tooling . . . fast set-up. Automatic operation of chucks does away with levers, valves, gages . . . leaves both hands free. Safety devices give full protection. There are many combinations of spindle speeds . . . all tool slides independently operated. Machine keeps young in performance, even when old in years.



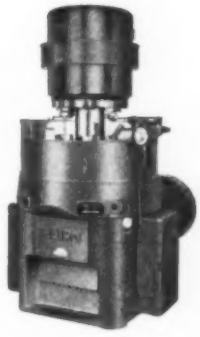
BAIRD MULTIPLE TRANSFER PRESS

Simply stated, this press combines, in one cycle, operations that might otherwise require several smaller machines with operator for each. It feeds coil stock for piercing, lettering, embossing . . . then cuts the blank, places it in transfer fingers, moves it to several tool stations, ejects it . . . all automatically. Ask us for Case Histories Bulletin.

BAIRD 5.4 VC LATHE

Continuously revolving turret eliminates non-productive indexing time in wet, dry cutting of light jobs, boring, facing, turning, etc. Tools feed both on "in" and "out" of cutting stroke. A most versatile tool for work within its range.

Bulletins on all above on request.



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AUTOMATIC MACHINE TOOLS • AUTOMATIC WIRE & RIBBON METAL FORMING MACHINES • AUTOMATIC PRESSES • TUMBLING BARRELS

Ford Motor Co.

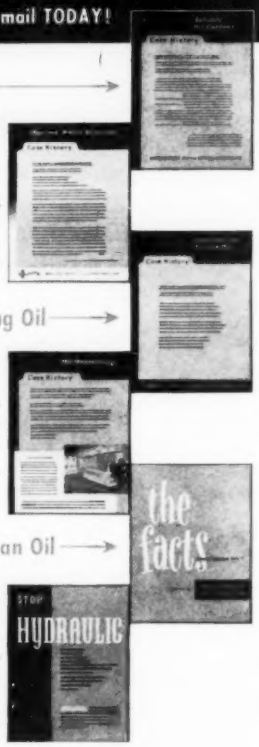
saves 96.5%

on COOLANT FILTRATION COSTS with HONAN-CRANE Equipment

GET THE DETAILS!

These case histories and "Clean Oil Bulletins" describe how industrial plants, large and small, save thousands of dollars annually with Honan-Crane Oil Purification and Handling Equipment.

TEAR OUT THIS AD, check the boxes and mail TODAY!



Soluble Oil Coolant →

☐ Case Histories: Ford Motor Company and Milwaukee Gas Specialty Co.

Chip and Waste Removal →

☐ Case Histories: Manufacturer of Fine Automobiles and Minneapolis Electric Castings Company. (Houdaille Conveyor Systems.)

Machine Tool Cutting Oil →

☐ Case History: Wagner Electric Corp., St. Louis.

Oil Quenching →

☐ Case Histories: Cleveland Graphite Bronze Co., Ft. Wayne Works of International Harvester and Salisbury Axle Division of Dana Corporation.

The Facts About Clean Oil →

☐ 14-Page booklet describes highly profitable advantages of oil purification in wide variety of industries. Gives brief case histories.

Hydraulic Bulletin →

☐ 8-Page booklet tells how Honan-Crane Equipment reduces downtime and costly repairs on hydraulic presses, machine tools, plastic molding machines, etc.

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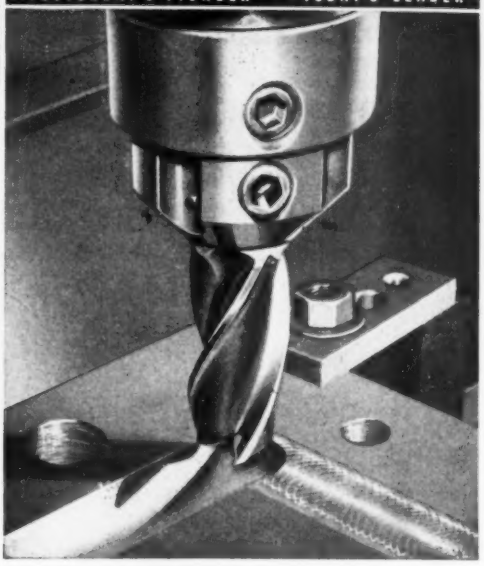
205 WABASH AVENUE
LEBANON, INDIANA

A Subsidiary of Houdaille-Hershey Corp.

YESTERDAY'S PIONEER . . . TODAY'S LEADER



NEW HEAVY DUTY END MILLS and HOLDERS

(Both are Stock Items)

● Look at this rugged 2″ diameter Weldon end mill with 4″ long flutes which made a 2½″ deep cut in a solid block of die steel—4140 steel heat treated to 260 Brinnell. The feed was 1½″ per minute, and the material was removed at a rate of 7½ cubic inches per minute. The shank of this end mill is 2″ in diameter.

This HEAVY DUTY Weldon end mill is held by a new-style end mill holder which bolts securely on to the nose of the milling machine spindle. The holder, located by a centering plug, is driven by two drive keys on the spindle nose.

For top performance and sturdy long life in end mills—large or small—look to Weldon.

Weldon distributors throughout U.S.A. and Canada carry complete stocks to serve you

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THE WELDON TOOL CO. Cleveland 4, Ohio

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more advanced welding on alloys, sheet metal, and pipe. The 32 basic lessons cover welding mild steel in all positions, and the remaining 29 lessons deal with the advanced applications.

Practical welding exercises and questions and answers are given for each lesson, making the book of real value to the beginner as well as helping him to advance in knowledge and skill. Sections include latest welding procedures for faster and lower-cost welding; automatic and semi-automatic hidden-arc welding; how metals are made and how to identify them; how to select welding joints; and how to make common machine parts by welding instead of casting.

•

MATERIALS HANDBOOK (7TH EDITION) —*By George S. Brady, consulting engineer. Published by the McGraw-Hill Book Company, 330 West 42nd St., New York 18, N. Y. 913 pages, 9x9 in. Price $8.50*

Information on 1500 more materials has been included in this new edition, bringing the total to over 8800. Part I gives pertinent physical and chemical properties, describes alternate and substitute materials, gives sources, trade names, and typical applications. Part II contains charts, maps, and tables on world distribution and production of the materials of industry, with interpretations and analyses, for background information. It occupies 68 pages of the total space. A name index takes up 49 pages.

All kinds of materials are included —metals, alloys, refractories, abrasives, woods, and so on—and information is broadly basic. This is a reference manual, not a series of detailed treatises, and as such is particularly useful to purchasing agents and to engineers who must work with many kinds of materials.

•

PUNCHING, SHEARING AND BENDING— *By William C. Tucker, chief engineer, Tool Div., Buffalo Forge Co. Pocket size (4¾ x 2½ in.), 80 pages. Published by the Buffalo Forge Co., 490 Broadway, Buffalo, N. Y. Price, $3.*

Machines for punching, shearing and bending are generally considered "simple" types of equipment, and as a result the people who use them and the people who design tools for them have never been given adequate information. This book sets out

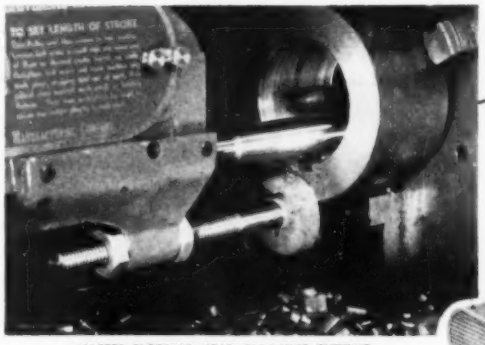
Step up PRODUCTION

ON YOUR

LATHE—TURRET—OR MILLING MACHINE

with **Master Machine Tool Attachments**

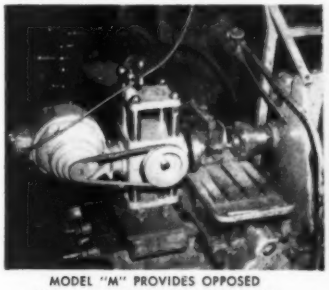
(MASTER LATHE CONVERTER)



MASTER SLOTTING HEAD ON LATHE CUTTING ½" KEYWAY IN STEEL SLEEVE IN 4½ MINUTES

BASIC MILLING UNIT

The Master attachments can be used profitably on many production operations. The basic milling unit with the many types of precision heads gives you facilities for milling, grinding, boring, drilling, indexing, slotting, and keyseating. They are an outstanding value for general purpose use in maintenance, repair, tool room, and experimental shops, as well as production, thus providing equipment that performs a full range of shop operations at a minimum investment. Investigate this valuable shop tool, illustrated in new catalog. Three sizes: Model "C," ⅓ hp — 9" to 13" lathes; Model "B," ½ or ¾ hp — 13" to 18" lathes; Model "M," 1 or 1½ hp — 18" to 72" lathes.



MODEL "M" PROVIDES OPPOSED MILLING HEAD ON HORIZONTAL MILL

MASTER MILLING ON TURRET LATHE COMPLETING PART IN ONE SET-UP

WRITE FOR NEW ILLUSTRATED 24-PAGE CATALOG

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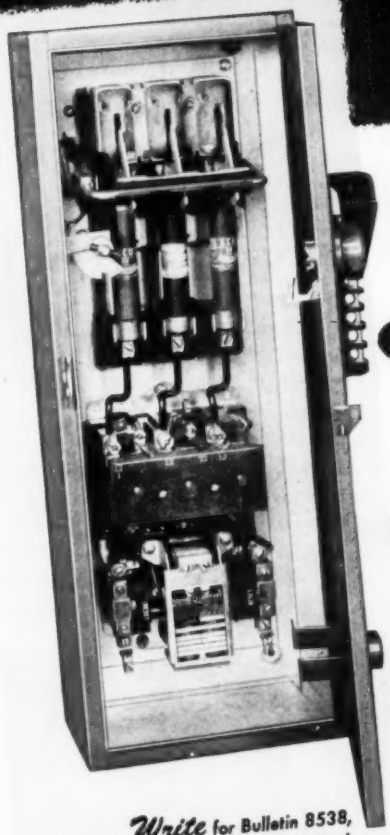

THIS NEW SQUARE D COMBINATION STARTER (SWITCH TYPE) offers Greater Operator Safety and Longer Motor Starter Life

NEW ***Switch Operating Mechanism*** provides maximum operator safety. Interlock prevents opening door when disconnect is on. When door is re-closed, self-aligning handle indicates true position of disconnect. Operating handle can be locked on or off with one, two, three or four padlocks of varying sizes. Handle-locking mechanism also locks door.

NEW ***Switch Design*** has quick make and quick break action—no dead center—visible blades for easy checking—magnetic arc plate for high rupturing capacity—dead-front line terminals, protected by hinged arc chamber cover—positive pressure jaws and fuse clips—non-tracking insulation.

NEW ***Features in Magnetic Starter Design*** Square D's time-proven design has always provided easy installation, simple maintenance, and long life. Now, even longer life is assured by straight line, guided motion of armature and movable contact assembly which eliminates bearing and reduces wear. For added convenience and flexibility, Square D starters now have NEMA standard mounting and wiring.

Write **for Bulletin 8538, SQUARE D COMPANY, 4041 North Richards Street, Milwaukee 12, Wis.**

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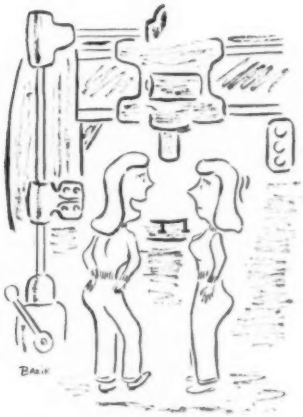
to correct this deficiency by discussion of the fundamentals of the machines and the tools. An overly technical approach has not been used. Instead, the author has kept in mind the many questions raised by industrial personnel over the years and has analyzed their true needs. Construction and operation of the several machines are described. Other data include: comparative punching capacities, cold-shearing limitations, average ultimate strength of materials, good-practice recommendations, and notes on avoiding damage to the tools and injury to the operator.

•

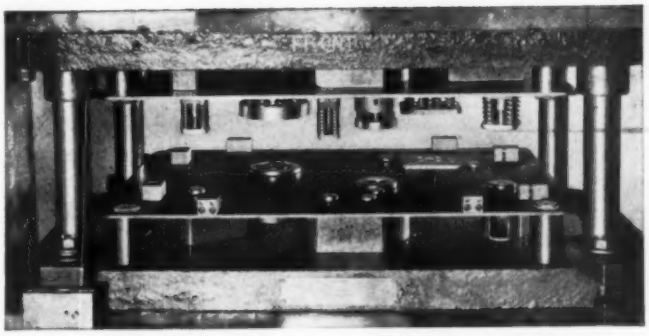
SOUND SLIDEFILM GUIDE AND COMPLETE SOURCE LIST; *Fifth Edition —compiled by the editors of Business Screen. Published by Adio-Visual Division, Operadio Manufacturing Company, St. Charles, Ill. Price $1.00. 60 pages.*

This is a listing of over 1000 sound slidefilms available for mainly educational purposes. The editors have not made any critical evaluations of the films (which are slidefilms—not movies), and have therefore packed a lot of information into a small booklet.

Each film is indexed by name, and is listed in its category. Also given are length of film (minutes), method of obtaining it (loan, rental, or purchase—price listed), source of film (or where to get it), and a short description of what material the film covers. Also listed are names and addresses of film sources.



"Why do all the guys call this a boring machine? They all look boring to me."



● Magnetic Perforating Die set-up in small inclinable punch press.

Magnetic

PERFORATING DIES

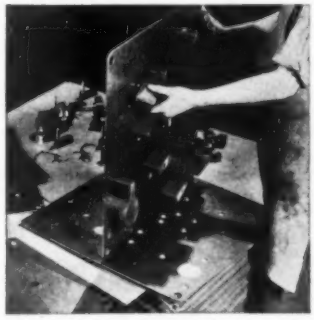
NEW and FAST Method for perforating Sheet Metal

SAVE PRESS DOWN TIME. Approximately 15 minutes required to change from punching one subject of say 20 holes to a different 20 hole arrangement. Whistler Magnetic Perforating Dies *increase* press production.

HOLD CLOSE TOLERANCES. Hole centers may be held to .0005" accuracy or as close as can be jig bored.

GREATER PUNCH AND DIE LIFE. Concentricity of punch and die assured thus giving uniform clearance around punch, increasing punch and die life.

SAVE FLOOR SPACE. Die storage cut to a minimum because only the 2 locating templets are stored ..all that is required to duplicate the set-up.



● Die retainers complete with bushings being inserted in die templet.

REDUCE DIE COSTS. Whistler Magnetic Perforating Punch and Die units are used repeatedly for different hole arrangements. When completing one job, remove all units from templet and put them into service on the next different set-up. Combine any number of hole sizes and shapes. Punch and die costs are amortized over continued reuse in many jobs.

Write for Catalog...

Whistler Magnetic Perforating Punches and Dies have proven their cost-cutting advantages in many prominent plants. The catalog shows how. Send for it today.

S. B. WHISTLER & SONS, Inc.

758 MILITARY ROAD, BUFFALO 17, NEW YORK

THE TOUGHER THE CUTTING JOB . . .

. . . THE BETTER THE OPPORTUNITY FOR

abrasive cutting

Here's one way to open the door to savings . . . at least it's the *right method* . . . abrasive cutting!

And the *right* abrasive wheels are Allison. Whether you're cutting steel, glass, non-ferrous metals or ceramics . . . tube, rod, bar stock or shapes . . . Allison Wheels cut at high speeds, accurately to a few thousandths, with little or no need for after-finishing.

Let one of our qualified specialists – an Allison Abrasive Cutting Expert – recommend the right equipment and right wheel to help you cut costs where you're cutting!

We like tough jobs

. . . consult us about yours!

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ABRASIVE CUTTING WHEELS

H&G DIE HEADS

WITH INSERT CHASERS

FOR ALL MACHINES USED FOR CUTTING SCREW THREADS

The famous H & G Die Heads come in styles and sizes for all types of machines, including threading machines, chucking machines, drill presses, turret lathes, and automatic screw machines, such as Brown & Sharpe, Cleveland, Cone, Davenport, Economy, Foote-Burt, Greenlee, Gridley, Acme-Gridley, New Britain, New Britain-Gridley, Swiss, etc.

The small, inexpensive high-speed steel insert chasers are held by rugged carriers and cut threads straight and true to the close tolerances required.

The majority of expert production men prefer these die heads because of the ease with which insert chasers are resharpened and set, the low cost of insert chasers and the greater quantity of threads per grind and number of pieces threaded per chaser dollar.

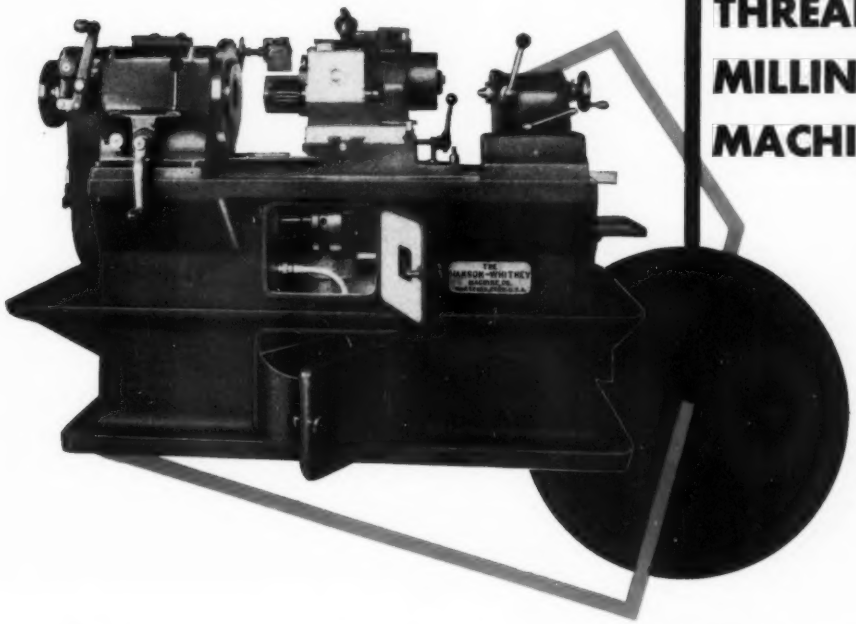
The reduction in inventory will pay for new die heads. **For example:** If you have $1,000 in chaser inventory, changing to H & G will require only $300, setting free $700 for the purchase of new H & G heads. This is due not only to low cost of chasers, but to interchangeability and long life.

Check and Mail for Free Copy ☐ "Selecting Proper Die Head for the Job"
☐ Style MM ☐ Style DMS ☐ Style DM ☐ Style TM

THE EASTERN MACHINE SCREW CORPORATION
20-40 BARCLAY STREET **NEW HAVEN, CONN.**

20-40 Mfrs. General Purpose Die Heads, Insert Chaser Die Heads, Threading Machines.

PERFECT THREADS external or internal
NO SPOILAGE with Hanson-Whitney THREAD MILLING MACHINE



Today's requirements for low cost, perfect threading of so many, so varied and such costly metal parts make it necessary that work spoilage be eliminated.

The "Milling Process"... and, in particular, the Hanson-Whitney Semi-Automatic Thread Milling Machine . . . gives you 100% perfect threads. And it produces at high speeds on many materials, otherwise difficult to machine.

Because of the Multiple Cutter principle used, threads of varied lengths are completed in one revolution of the work. Threading may be right or left hand, external or internal, straight or tapered. All operations are automatic except insertion and removal of work.

Three machine sizes permit External Threading from ¼" to 10" dia.; Internal Threading ¾" to 10" dia. The size pictured above (the largest) has a capacity of 10" dia. x 24" length.

For low-cost, perfect threading select the H-W Thread Miller . . . a standard of highest quality throughout the industrial world.

SPECIAL BULLETINS ON REQUEST

HANSON-WHITNEY COMPANY, HARTFORD 2, CONN. • Division of The Whitney Chain Company

Hanson Whitney

PIONEERS OF FINISHED TAPS

SPOILAGE

Obsolescence's Bad Actors In Any Plant!

DOWN TIME

LOW PRODUCTION

You can take these boys out of the picture with late model, modern machines. Perhaps more good can be achieved with new RACINE Metal Cutting Equipment than you realize.

Cutting-off, your first operation on nearly all production jobs, may be the key to lower finished costs to you. New standards of production, accuracy and low operating cost, distinguish RACINE'S full line of Modern Power Saws. Capacities from 6" x 6" to 20" x 20".

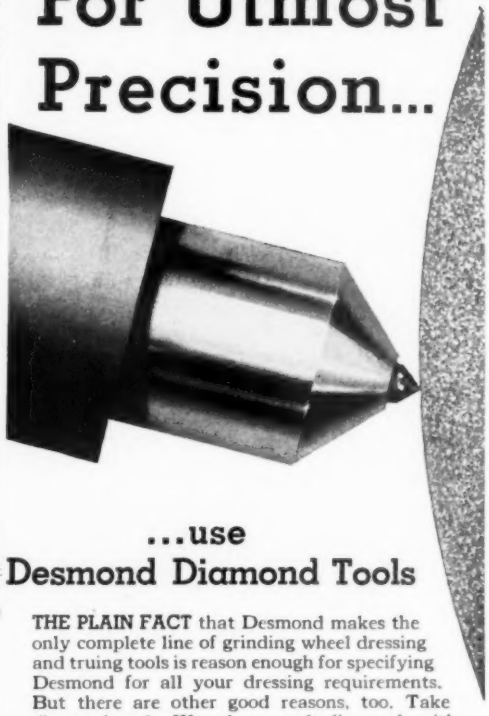
Let us give you current figures on the profit-making possibilities of these machines. We will cover general purpose, tool room and production cutting.

Write RACINE TOOL & MACHINE COMPANY, 1751 State Street, Racine, Wisconsin.

RACINE

RACINE STANDARD FOR QUALITY AND PRECISION

For Utmost Precision...



...use Desmond Diamond Tools

THE PLAIN FACT that Desmond makes the only complete line of grinding wheel dressing and truing tools is reason enough for specifying Desmond for all your dressing requirements. But there are other good reasons, too. Take diamond tools. We select rough diamonds with expert care, mount them (in hand tools or nibs) with hard-earned know-how, and *stand behind every single one.*

Fasten your Desmond diamond tools securely in the tool post or holder . . . with the tool axis at an angle of 10 to 15 degrees with respect to the radius . . . and turn the tool frequently to present a new diamond point. As a rule large diamonds run cooler and *do more work per dollar* than small ones.

Write for your copy of the Desmond Catalog No. 45 today. It will help you pick the right tool for the job—and get the most out of it.

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Desmond

the only complete line of grinding wheel

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BALL BEARING DRESSERS | REVOLVING CUTTER TYPE DRESSERS | DIAMOND HAND TOOLS AND NIBS | WHEEL TYPE DRESSERS | SIMPLEX STEEL-SLIDE VISE

What plays clean-up on the rubber-steel team?

...*a brush!* These are track pins of army tanks. Here, rubber "tires" are bonded to steel pins to produce strong, quiet-operating parts for the rigors of tank warfare.

The problem was to remove the rubber flash and film from six bearing and electrical-ground sections of the pin after molding. With the help of the **O**sborn **B**rushing **A**nalyst, a machine with six Osborn Disc-Center* Wire Brushes was devised to remove the excess rubber from all six areas simultaneously . . . in a matter of seconds.

Throughout all industry, Osborn power brushes are simplifying cleaning and finishing operations and improving products of every description. Here's how an **O**sborn **B**rushing **A**nalyst can help you. Call or write, *The Osborn Manufacturing Company, Dept. 518, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

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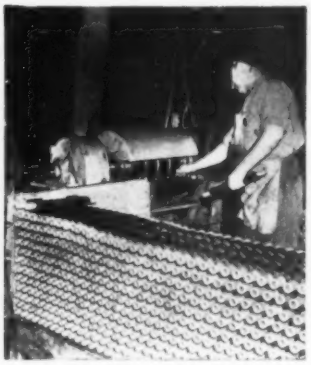
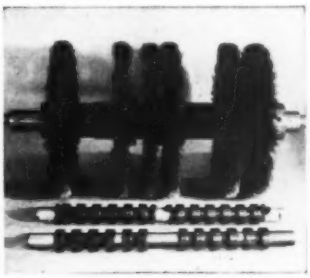
OSBORN

LOOK FOR THE NAME OSBORN...RECOGNIZED EVERYWHERE FOR QUALITY WORKMANSHIP AND MATERIALS

THE FIGHTING MACHINE. Tanks of this type are equipped with track pins of the type shown at the left.



THE BRUSHING MACHINE. Molded track pins are fed in one at a time. An Osborn Disc-Center Wire Wheel Brush meshes with each of six sections where flash and film are to be removed. Areas are cleaned thoroughly in a few seconds and pin is discharged.

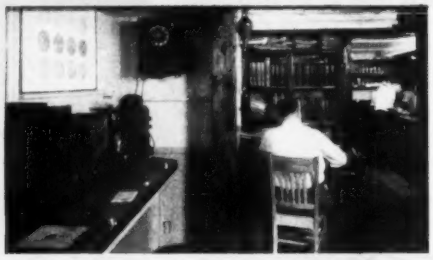


THE BRUSH SET-UP. This photo shows construction of arbor with six Osborn Brushes spaced to fit into track pin grooves where rubber is to be removed. In the foreground are track pins before and after brushing.

BROACHES

IN ALL SHAPES AND ALL SIZES

FOR SURFACE AND INTERNAL BROACHING



WE START WITH THE STEEL

. . . and we check its LAPOINTE-specified composition by disc inspection in our metallurgical laboratory. Assurance of *genuine quality control* is obtained in our heat treating department through the use of the Rayo-tube Temperature Control. For a double check, we treat pilot pieces of the same diameter as the tool, then we save a "coupon" of the tool itself!

AVOID DIVIDED RESPONSIBILITY! YOUR BROACHING MACHINES, TOOLS,

almost any production job will lend itself to BROACHING

. . . including cast iron, bronze, aluminum, stainless steel and most of the new alloys of titanium.

PRODUCTION SPEEDUP?

If you are interested in *stepping up your production capacity*, you probably realize that BROACHING is the *fastest possible method.*

REPETITIVE ACCURACY?

If you require many — or a few— parts *machined exactly alike* without costly methods involving rejects and re-working, remember that BROACHING gives you *repetitive accuracy to precision limits.*

LAPOINTE is the world's oldest and the world's largest manufacturer of broaching machines and broaches. Isn't it obvious that LAPOINTE has *more broaching experience* to offer, than any other manufacturer?

INQUIRIES WELCOMED on any problem involving broaching, or the possibility of broaching. Literature available by writing LAPOINTE, 2 Tower Street, Hudson, Mass.

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HUDSON, MASSACHUSETTS • U. S. A.

Branch Factory: Watford, Herts., England

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHES AND BROACHING MACHINES

AND FIXTURES CAN ALL BE ENGINEERED AND BUILT BY LAPOINTE

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It's easy to switch to Molybdenum High Speed Steels *

- It is readily available from manufacturers and warehouses.
- It makes as good a tool—or better—than a tungsten type.
- It saves money.
- It conserves tungsten for uses in which it is really needed.

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COOLANT PUMPS

To increase national output so as to meet the additional needs of our armed forces means we'll have to produce more in less time. The cooperation of everyone from the top executive down to the newest apprentice is essential.
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with PLANETARY THREAD ROLLING

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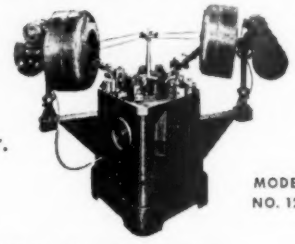
A proven automatic production machine that outmodes all former types

Die life, 5,000,000 pcs.
Accuracy, class 3
Capacity, ¼" x 2"
Fetter Nails, 36,000 per hr.
Set-up time 45 minutes



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TAPMASTER
High Production Tapping Machine
Range ⅜" to 4"
Send blueprints for production data

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THE LOW COST "UTILITY" SERIES BAND SAWING AND BAND FILING MACHINES
THE GENERAL PURPOSE "ML" SERIES CONTOUR MACHINES
DoALL
THE HIGH SPEED "ZEPHYR" SERIES CONTOUR MACHINES

• Four models—16" throat. Variable dual speed range 50 to 350 F.P.M. and 860 to 5200 F.P.M. Also available fixed speed. For small shops and experimental or model work in large shops.

• Five models—precision machines for general purpose band machining. 50 to 1500 F.P.M. variable speed for conventional metal cutting. ½ to 2 H.P. Throat depths 16" to 60". These are multi-purpose machines—sawing, filing, polishing.

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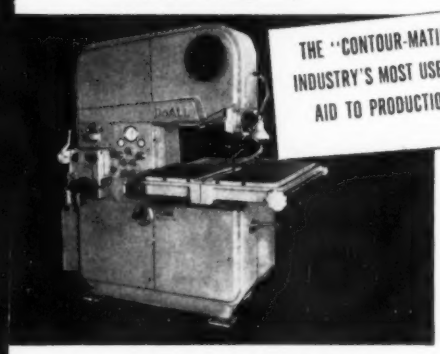

• The features and capabilities of all other models *plus* hydraulic controls, wider speed range, more power, greater tool variety, etc. Cuts any material, any shape. Use as all-purpose or single purpose tool—works faster, better; cuts costs, increases output per man.

EVERY SHOP can have the benefits of DoALL band machining, the fast, economical process that "slices" material apart instead of reducing it to pile of chips. There is a line of DoALL Band Machines and Band Tools for precision cutting every material, every conceivable shape—sawing, line grinding, polishing, honing, friction sawing, cutting. For production, for maintenance, for toolmaking—there is a DoALL machine to save manhours, material and money, to free other machines to work for which they are better suited. Find out what DoALL can do for you. Ask to have a DEMONSTRATION of a DoALL Band Machine right in your plant. Call your local DoALL Sales-Service Store or write:

THE DoALL COMPANY • 254 N. Laurel Ave., Des Plaines, Ill.

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Learn about the complete machining facilities offered by modern DoALL Band Machines.

INDUSTRY'S NEW TOOLS **DoALL** 27 SALES-SERVICE STORES

8-3

Machine Tools . . . Gaging Equipment . . . Tool Steel . . . Band Tools . . . Metal Working Supplies

10 Good Reasons

why YOU should use NATIONAL Keyseating Millers on your next job

They will mill keyseats:

- in one cut.
- in offset holes.
- that are straight.
- with parallel sides.
- partly through holes.
- for interchangeable parts.
- without clamping the work.
- of standard width and depth.
- in holes that are closed at one end.
- where keyseating machine can't reach.

national
MACHINE TOOL CO.
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For Catalog No. 17
complete, handy size

Tippy Says:

Tippy Says: . . . Take a tip, try TIPALOY!

JULIUS CAESAR WAS A "HOT ROD" JOHNNY HE DROVE A WELDED CHARIOT!

Caesar played it safe . . . he knew he could be reckless in a welded chariot! Why don't you play it safe . . . use TIPALOY Resistance Welding Electrodes that will keep your production costs on the safe side . . . yet give you so much more than ordinary electrodes . . . LOOK! . . . less mushrooming, less redressing and greater current density . . . investigate NOW! . . . you should be using TIPALOY Resistance Welding Electrodes!

Write today for test samples and "the story of STRAIGHT LINE conductivity!"

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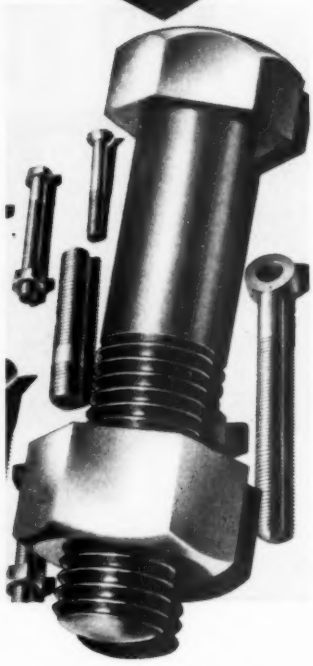
Branches in All Principal Cities

First for BOLTS NUTS STUDS



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You can count on a uniform Class 3 Fit when you buy Pawtucket threaded fasteners. Accurately made in standard dimensions — or to your specifications.

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at the supervisory and executive level? An advertisement in *American Machinist's* classified section (see page 261) will bring your needs to the attention of the most likely prospects for that vacant position. Men, from the rank of Supervisor to Works Manager, read *American Machinist* regularly.

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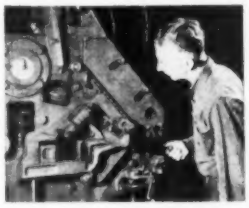
HOW COLONIAL IRON WORKS OVERCAME FABRICATION "BOTTLENECKS"

using this "Buffalo" U.I.W.*

F. F. Schwab, Partner, of Colonial Iron Works, Buffalo, New York, Ornamental Iron and Steel fabricators, writes this about his "Buffalo" No. ½ *Universal Iron Worker: "We have not only found a saving of time in the fabrication of most of our steel work, namely stair fabrication, punching, shearing, etc., but also, due to our devising jigs and fixtures which we have attached to our machine, we have overcome many of the 'bottlenecks' which we have heretofore had problems with.

"In short, we can say that it is one of the best investments we have made in our shop."



Above: The Universal Iron Worker simultaneously punching channel and shearing flats, at Colonial Iron Works.

Left: Same machine cuts an angle. It can also cut rounds and squares. Write for information on this timesaver, the "Buffalo" Universal Iron Worker.

BUFFALO FORGE COMPANY

509 Broadway — Buffalo, New York

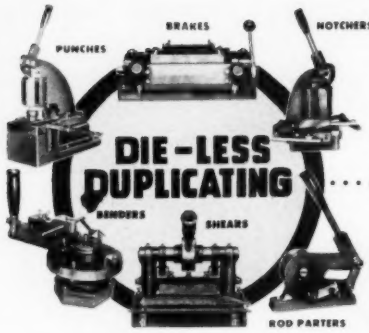
CANADIAN BLOWER & FORGE CO., Ltd., Kitchener, Ont.

DRILLING PUNCHING CUTTING SHEARING BENDING

From the *American Machinist* Library of *Tips for Top Shop Men*

SLAVERY was not abolished by Lincoln. He did end physical slavery, but man himself must end mental slavery to habit. Education will help, but the real problem is to breed a race of open-minded, inquiring men who welcome the chance to wonder, to question and to analyze—then to take a chance on a new idea that looks sound.

PROCEDURE for methods improvement: Pick an operation to be improved. Put down in writing what happens—the details. Challenge each detail in order. Where a chance for improvement appears, develop the better method. Apply it on the job.



DIE-LESS DUPLICATING .....with **di-acro PRECISION MACHINES**

Eliminate dies . . . speed production . . . in both your experimental and quantity run duplicating operations. An unusually wide variety of both simple and intricate parts can be precision made by "DIE-LESS DUPLICATING" with the individual or co-operative application of DI-ACRO Precision Machines (see examples at right). DI-ACRO Machines are now offered in a total of six types and 21 different sizes, including two new units—a power driven Shear and a hydraulic Bender.

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ENGINEERS—DESIGNERS—PRODUCTION MEN should all have this informative catalog which contains technical data covering DI-ACRO Machines and our offer of "Die-Less Duplicating" Engineering Service to aid in solving design and production problems. WRITE FOR YOUR COPY TODAY.

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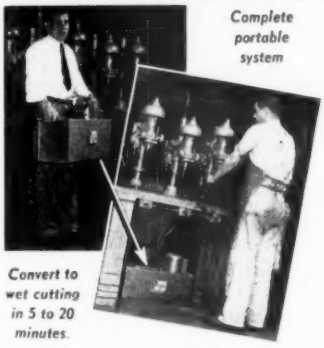
← Pronounced "DIE-ACK-RO"

DI-ACRO PRECISION MACHINES DIE-LESS DUPLICATING

O'NEIL-IRWIN MFG. CO.

311 8th Avenue • LAKE CITY, MINNESOTA

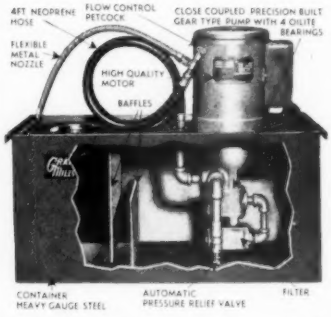
Get more production from your machines with GRAYMILLS Pumps and Coolant Systems



Complete portable system

Convert to wet cutting in 5 to 20 minutes.

It pays to use the new, husky Graymills Coolant systems and pumps to convert machines to wet cutting for replacement or as standby units. They increase cutting speeds, improve work quality . . . Most industrial distributors stock standard units.



Sturdy high pressure gear models . . . smooth high volume centrifugal types in 1/25 to ½ HP ratings, 1 gal. to 70 g. p. m. with tank capacities from 5 to 38 gals. Also immersion type centrifugal pump and motor units.

GRAY MILLS

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In case after case it has been demonstrated that J. K. Smit diamond tools do have longer, more productive life.

Why?

Because, sixty-three years of experience in handling Industrial Diamonds has aided in developing Diamond Tools to their present high degree of utility. This improved Tool performance means economy.

Because of their experience, our field engineers have been called upon to solve many of industry's industrial diamond problems. Consider this, when you have problems where a J. K. Smit Engineer can be of help.

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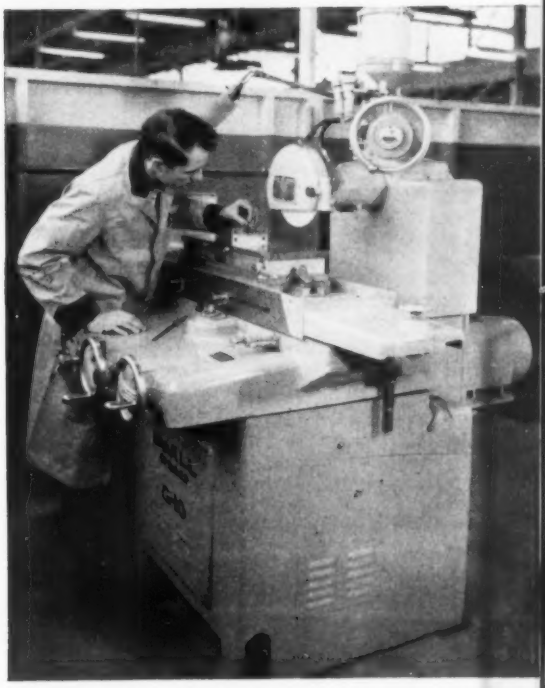
UPS PRODUCTION 25% BETWEEN DIE GRINDS

DoALL "COOL-GRINDING"

(U.S PATENT NO 2470350)

GIVES IMPROVED FINISH ON HIGH CARBON HIGH CHROME NN STEEL



ONWARD Manufacturing Company, Ltd., Kitchener, Ont., knows the benefits of DoALL *"Cool-Grinding."* They say, *"Since using this Grinder with "Cool-Grinding" we have obtained a 25% increase in number of pieces per die grind over former methods of grinding."*

WHY? Because DoALL "Cool-Grinding," with coolant flowing *through* the wheel, prevents excessive heat that scores, draws the temper or checks the metal finish. The finish is smoother, too. The die does more work before it needs grinding. You save time and money and material. Ask to have a Free DEMONSTRATION of DoALL "Cool-Grinding" at your own plant. Call your local DoALL Sales-Service Store or write:

"COOL-GRINDING" WILL PREVENT BURNED OR SCORED FINISH, LENGTHENS THE LIFE OF YOUR TOOLS

"Cool-Grinding" takes liquid in at the hub of the wheel, and through centrifugal force passes it through the pores of the wheel and out as a fine mist *at the point of contact between the wheel and the work.*

SEND FOR CATALOG *Today*

—see how "Cool-Grinding" works, why it is better, how it will benefit you —see the different models of DoALL Precision Grinders for toolroom or production work.

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27 SALES-SERVICE STORES

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DoALL

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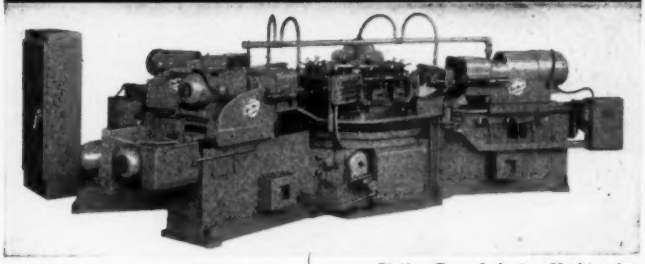
Drilling and Reaming

388 KING PIN HOLES PER HOUR



Station Type Indexing Machine for drilling and reaming king pin holes.

On a Davis & Thompson 5 Station Machine

This type MDT FIVE STATION INDEXING DRILLER has five fixtures mounted on the index table. Each of these fixtures holds 2 RH and 2 LH automobile front suspension support arms. Four ROTO-MATIC Power Heads, each having four spindles, perform the following operations:

1. Drill 53/64" dia.—Half way through.
2. Drill .823" dia. — Balance of way through.
3. End Cut Ream .8547/.8550" — Full length of hole.
4. Finish Ream .8635/.8637"—Full length of hole.
5. Load and Unload.

Two RH and two LH pieces are completed at the end of each cycle. Cycling is automatic, and, operator loads and unloads during machine cycle.

4 New Davis & Thompson Mechanical Power Heads

Included in the design of this machine are the new ROTO-MATIC Mechanical Electrical Power Heads operated through screw feed. An important safety feature of these units is the patented overload release clutches on the feed. Because of the simplicity of their design the units require a minimum of servicing.

Free Data

Will be furnished on request.

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Davis & Thompson Company

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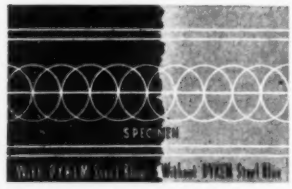
STOPS LOSSES

making dies & templates

Simply brush on right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.



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THE DYKEM COMPANY, 2301 B North 11 St., St. Louis, Mo.

L&I quality ground

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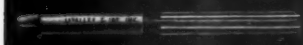
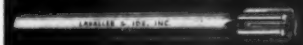
FOR EVERY PURPOSE

LONGER LIFE

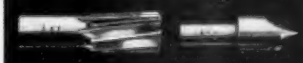
FINER FINISH



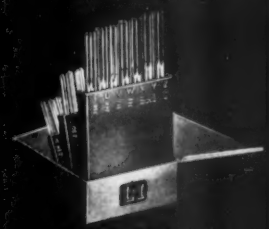
EXTREME ACCURACY



ECONOMY



PERFORMANCE



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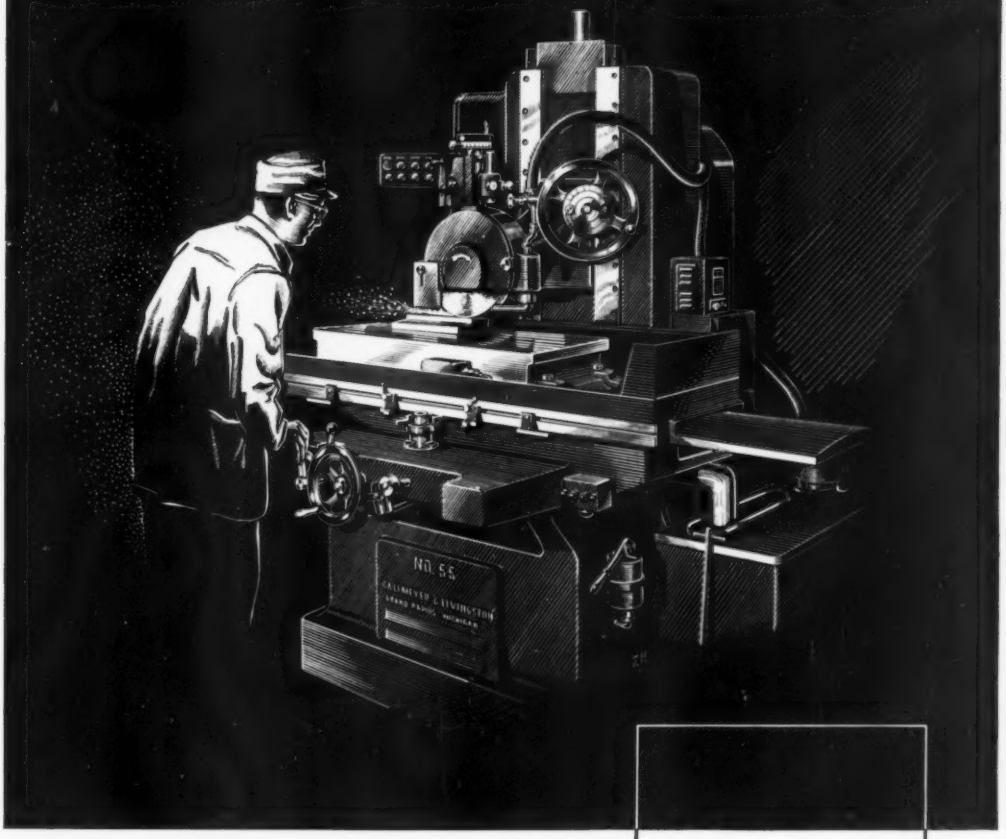

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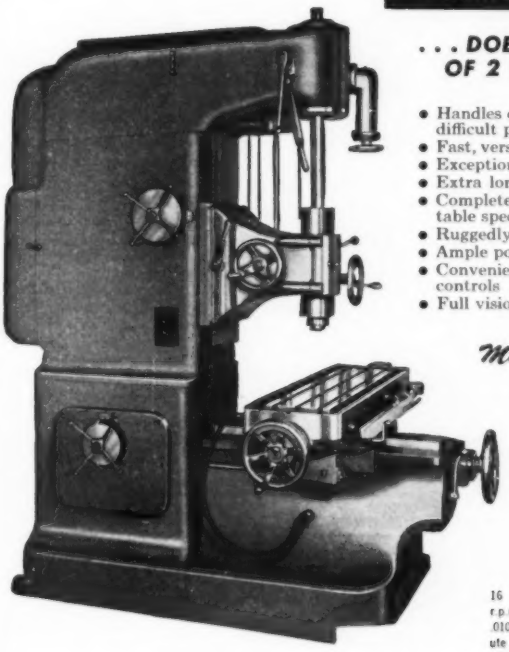

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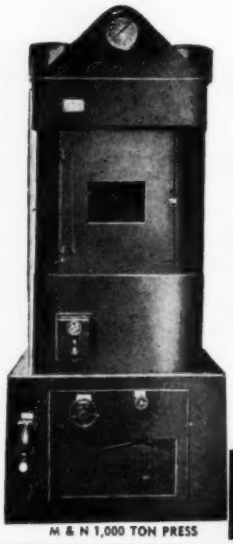

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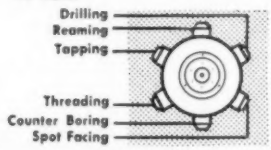

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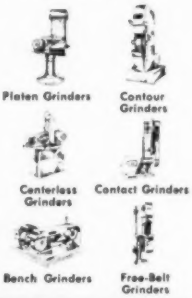

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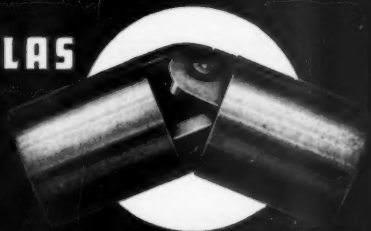

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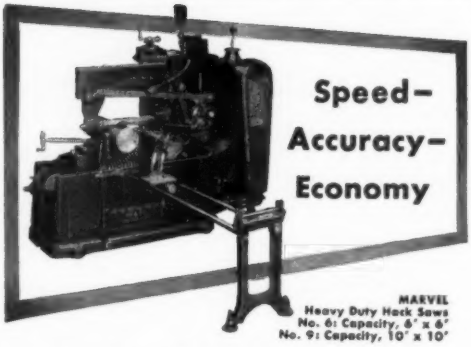

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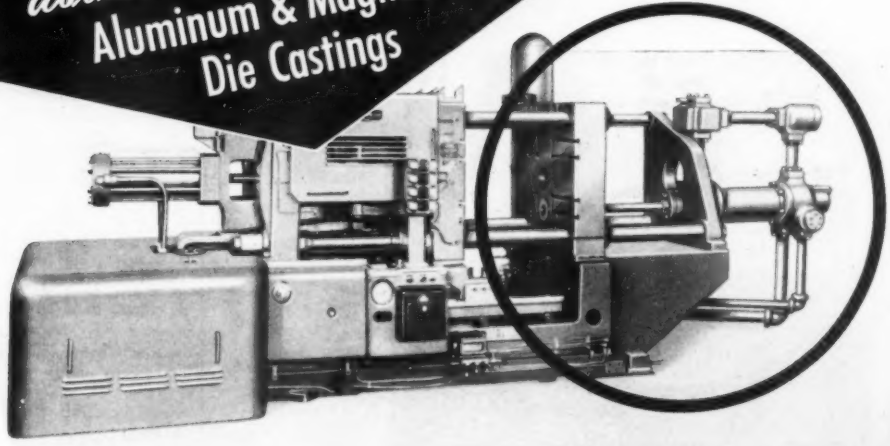

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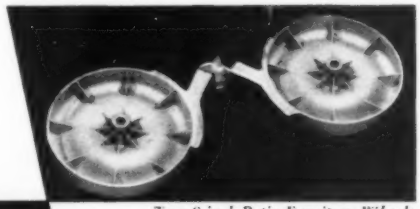

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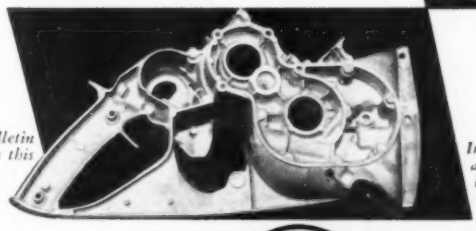

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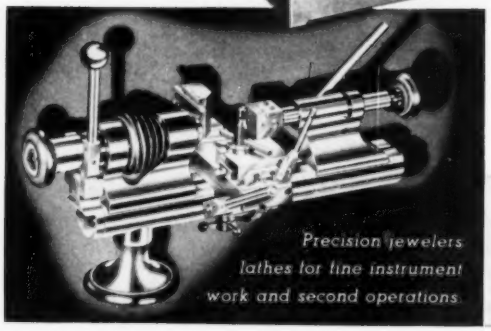

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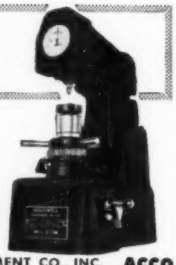

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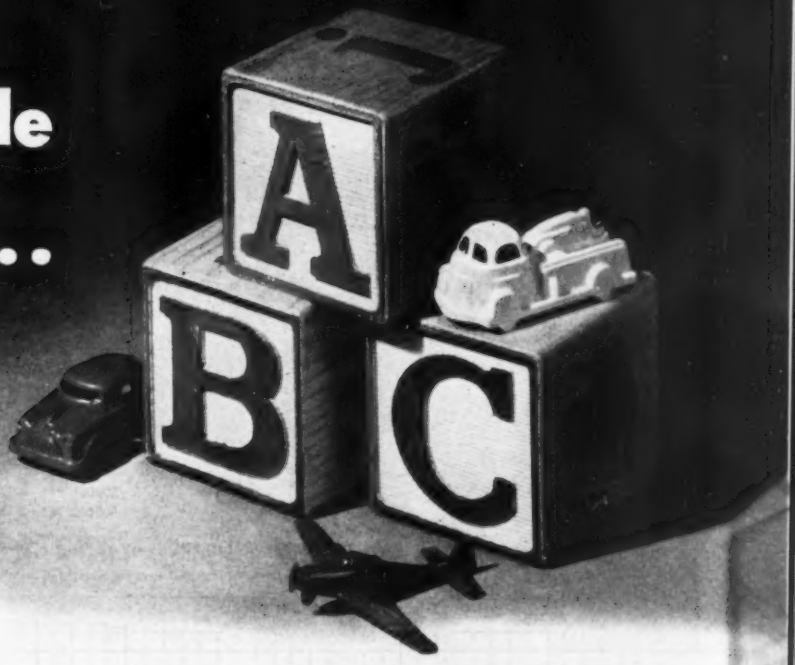

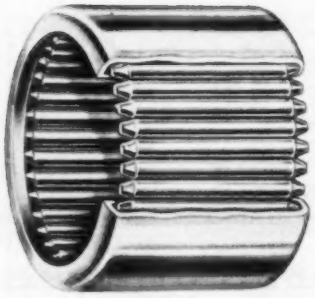

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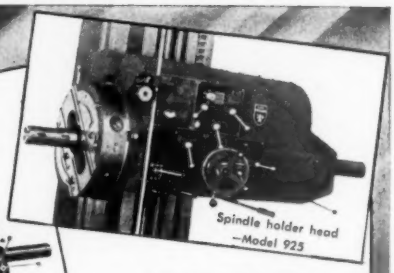

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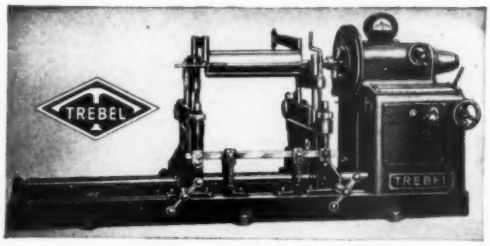

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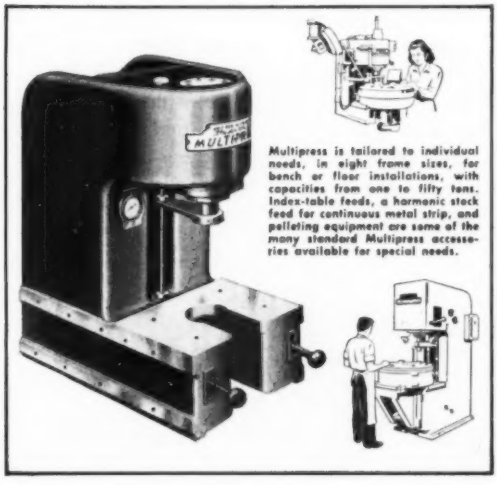
Every 18 seconds, with a single stroke of the ram, this 25-ton Multipress does a complete job of trimming flash from a streamlined cast-aluminum housing for one of the famous Hoover electric cleaners.

The job previously required four separate operations, two of which were done by hand, using files and grinding wheels. The records show that the Multipress method saves *six hours* for every hundred cleaner units turned out.

For maximum safety, the press is controlled through dual levers that keep the operator's hands out of the way of the moving ram. With operating hazards removed, worker morale is higher and time-wasting safety precautions are unnecessary.

It has also been found that the trimmed housings are more uniformly high in quality—and no special training or skill is required of the operator.

Gains like these are the usual thing where Multipress is adapted to today's needs for faster production, lower scrap losses, fewer rejects, safer operation, and better results. That's because Multipress incorporates advanced engineering that adapts the smooth, accurate *power control* of oil-hydraulic energy to new high levels of production efficiency. Write for full details.



Multipress is tailored to individual needs, in eight frame sizes, for bench or floor installations, with capacities from one to fifty tons. Index-table feeds, a harmonic stock feed for continuous metal strip, and pelleting equipment are some of the many standard Multipress accessories available for special needs.

The DENISON Engineering Company
1164 Dublin Road **Columbus 16, Ohio**

DENISON HydrOILics

Tool life greatly increased by reconditioning cutting oil *with*
BARRETT OIL EXTRACTION SYSTEMS

Reports from plants using Barrett Oil Recovery and Reconditioning Systems show surprisingly high percentages in increased tool life. Then, too, users are enthusiastic as to the improved condition of the reclaimed oil as well as the high returns on the investment. Some set-ups in plants engaged on defense production have paid for themselves in a few months.

The Barrett Centrifugal Oil Extractor—which is part of a complete system—recovers 100% of the removable oil or 98½% of the contained oil from chips and turnings in 2 minutes or less. Complete Barrett oil recovery and reconditioning systems include Extraction, Sterilization and Sedimentation, together with filtration. The units involved are available in various sizes, individually or as a group, and are available with full manual control, semi-automatic control or with full automatic control requiring only loading, unloading, starting and stopping of the extractor by the operator. Complete plans including storage tanks for reclaimed oil or for use in conjunction with existing equipment are also available.

With the Barrett system, abrasive-free oil assuring longer tool life can always be depended on. With Barrett Sterilization and Sedimentation equipment, cutting oil is also safe and free from contamination.

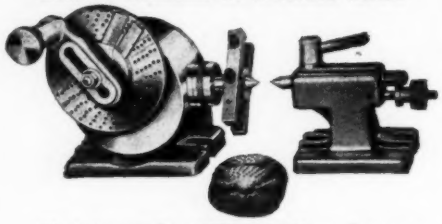
Investigate Today by Sending for Descriptive Bulletin of Oil Recovery and Reconditioning Systems

Barrett Centrifugal Oil Extractor — the heart of Barrett Cutting Oil Recovery and Reconditioning Systems.

THE LEON J. BARRETT COMPANY, 1800 Grafton Road, **WORCESTER, MASS.**

Designers and Builders of Centrifugal Machinery

OUTSTANDING VALUES BY L-W
LARGEST BUILDERS OF DIVIDING HEADS



Ideal for smaller Milling Machines. Spindle Treaded 1½"-8 to fit L-W 5" Universal Chuck.

Model SD 6½" Swing

• ACCURATE • RUGGED • 36 LB. • QUALITY CONSTRUCTION Only **$119.30**

Heavy duty headstock and tailstock designed for maximum rigidity. Alloy steel threaded headstock spindle with extra large tapered bearing and takeup adjustment collar. Head tilts to 90° in vertical position. Alloy stress-proof steel worm and accurately cut worm wheel cut to close limits for accuracy. Ball bearing thrust and adjustable for end play. Complete with three index plates for dividing all numbers to 50 and even numbers to 100, except 96T. Index chart shows all divisions obtainable to 380. Right or left hand models.

Model BP 11" Swing for plain milling machines. Shipping weight, 140 lbs. **$199.54**

Model AU 11" Swing. Fully Universal for complete indexing and spiral cutting. Shipping weight, 190 lbs. **$296.06**

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Economy

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BUILDING COMPLETE MACHINE TOOLS
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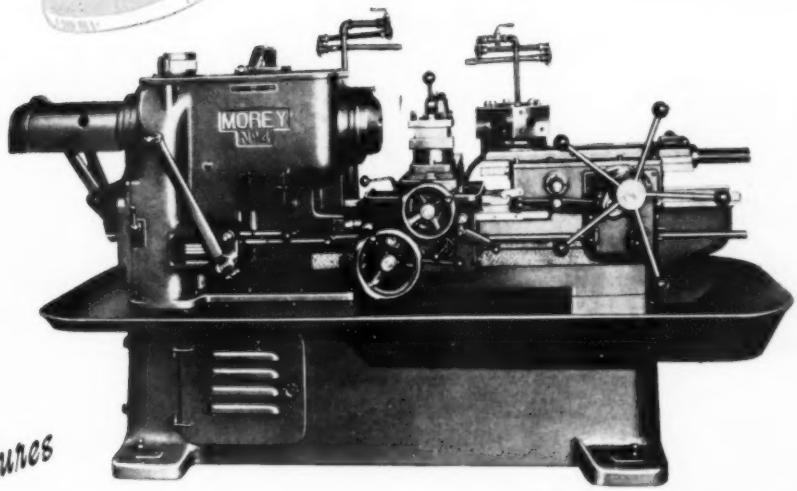
MOREY

TURRET LATHES

No. 2 Plain Type

Nos. 3, 4 and 5 Universal Type



Features

Infinite variable vibrationless spindle speeds.

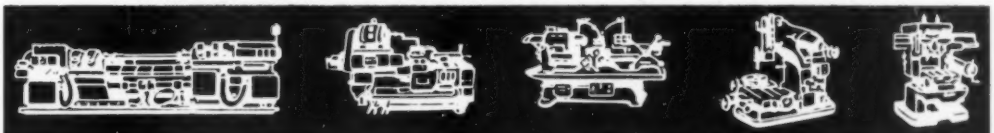
Remote speed selection control for speed and ease of operation.

The newly designed MOREY TURRET LATHES take advantage of tungsten carbide tools and incorporate all technical improvements in metals, electronics and hydraulics . . . our design is not hampered by tradition.

Size	Bar Capacity	Swing	Motor
No. 2 Plain	1" x 6"	14"	3 HP
No. 3 Universal	1½" x 10"	16½"	5 HP
No. 4 Universal	2" x 12"	19½"	7½ HP
No. 5 Universal	2½" x 14"	21¼"	15 HP

FOR BAR and CHUCKING WORK

OBTAIN MAXIMUM PRODUCTION WITH MINIMUM EFFORT FROM MOREY TURRET LATHES . . . **INVESTIGATE!**



MOREY MACHINERY CO. INC.

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Cable Address: WOODWORK, N.Y.

Telephone: CAnal 6-7400

Want to reduce your TAP BILL 50%? 59%? — even 75%?

BLAKE TAP SHARPENING EQUIPMENT DOES THIS FOR OTHERS

No. 3 in a continuing study of Tap performance records made by users of Blake Tap Sharpening Equipment.

TAP PERFORMANCE

Before Sharpening Tapping to Class #3 fit an 8-60 L.H. thread in brass—⅛" deep blind hole. Operation performed on automatic screw machine with average standard 3 flute commercial Grd. tap. No. of holes: 2000.

After Sharpening on Blake Equipment Tap reground with plus 5° hook in flutes increases average holes *per grind* to 25,000—an increase of over 1200% *per grind*. Average six grinds per tap before it is discarded as too small or too short in thread length. Total holes per tap—150,000.

Why Not You!

To get dollar-for-dollar value from your taps, you *must* sharpen them just as you do other cutting tools. The Blake Flute Grinder and the Blake Chamfer Grinder provide you with fast, accurate, and economical means for grinding straight flutes, spiral points, and the chamfered ends of your taps — a sure means of reducing your tap bill. Investigate today.

Ask for Bulletins 549 and 649

EDWARD BLAKE COMPANY

Black Diamond Precision Drill Grinders . . . Waltham Cutter Sharpeners . . . Waltham Thread Milling Machines . . . Surface Finish Standards.

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Reduces Packaging Costs
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STOP THAT WASTE!

Stop throwing away steel parts and tools found to have a soft skin. Heat-treatment can restore their decarburized surfaces to their original carbon content. It is not a difficult control problem . . . the dewpoint of the atmosphere generated for the furnace is the key to successful operation.

The *American Machinist* Special Editorial Report, "Carbon Restoration Overcomes 'Soft Skin' On Parts," contains a chart to guide you in this cost-saving operation. Reprints of this cost-conscious report are available for only 15 cents a copy. Write Reader Service Department:

American Machinist
McGraw-Hill Building **New York 18, N. Y.**

after you've read this magazine

. . . and clipped pertinent ideas, articles and advertisements for reference, *please do not burn or throw it away.*

Here are two sound reasons why:

1) Wastepaper can help to swell the funds of your local Boy Scout Troop, your church or other community organization. It gets a good price these days.

2) Whether in magazine form or not, wastepaper helps to fill the increasing need for paper pulp brought on by the mobilization effort.

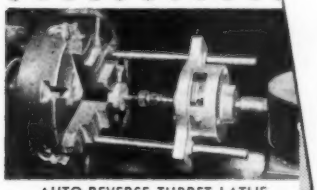
Collect it. Give it to your favorite organization. Chances are they have scheduled pick-ups.

ADJUSTABLE TAPPING HEAD

Fully geared Needle bearings on all spindles in head. Ball thrust bearings throughout. Bronze bushed. Sand cast aluminum case.

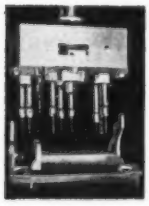
ADJUSTABLE DRILLING HEAD

This versatile tool permits you to take advantage of a wide range of adjustment without overhang.



AUTO-REVERSE TURRET LATHE TAPPING HEAD

A new tool, practical, time-saving, money-saving. In a turret lathe setup it allows you to tap the hole and back out the tap without stopping the work or reversing the machine.



MULTIPLE SPINDLE HEADS

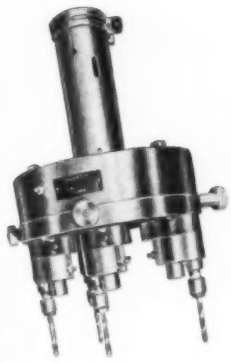
Shown is a ten spindle multiple drilling head, drilling ten varied size holes on different elevations.

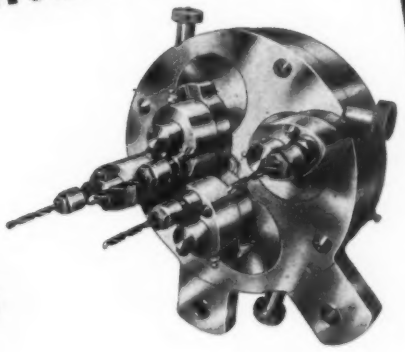
AUTO-REVERSE TAPPING CHUCKS

Cut small hole tapping cost with Errington Cone Drive 2 to 1 Auto-Reverse. Ball and bronze bearings throughout. Taps to 3/16" in steel and 1/4" in cast iron. Also with Jacobs Rubber Flex Chucks.

ANOTHER ACHIEVEMENT by ERRINGTON

FULLY ADJUSTABLE DRILLING HEAD





SIZES: 0 to 1/4"
3/16" to 1/2"
NO. 2 M.T. Socket Capacity

Here's a light, compact tool with a wide range of adjustment. Can drill on squares, rectangles, circles, triangles and irregular patterns. Head is fully geared. Grooved ball thrust bearings on all spindles. Needle bearings wherever possible. Simple locking arrangements. All moving parts hardened. Heads made with 3, 4 and 6 spindles.

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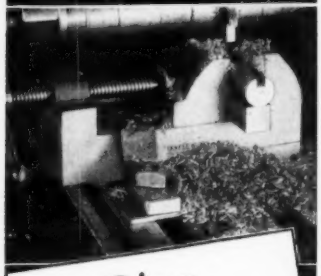

Give *Start-to-finish* work holding

Off the swivel base, end down for accurate marking.

Back on the swivel base, at the bench, for center punching.

Lifted onto drill press, still accurately in position.

Held in same position but moved to milling machine.

Take a job through every step without a misstep . . . faster, easier . . . in a "Yankee" Vise. Work lined up accurately from bench to drill press, to milling machine and back to bench. Lifts off and on a swivel base at the bench. Vise squared on top, bottom, sides and front end for machine work. Easily made into handy, economical jig. Hardened steel block, V-grooved, provided with each "Yankee" Vise. Four sizes, with and without swivel base . . . 1½", 2", 2¾" and 4" jaw widths. Your industrial distributor carries the full line. **"Yankee" Tool Book FREE!**

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NOW A WIDE RANGE OF AIR PRESSES

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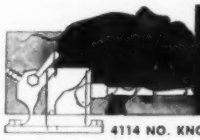
These presses deliver from 4 to 28 times the air line pressure, cost from $27.50 to $135.00, and will pay for themselves many times over in faster, more uniform production on light staking, criming, assembling jobs. Write for new catalog of air cylinders and other air-operated devices.



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This magazine displays more ideas and merchandise than a trade exposition. Make every issue your buyer's guide. Read the ads as well as the articles. That's reading with your eyes open for business.

HEADQUARTERS FOR BUSINESS INFORMATION

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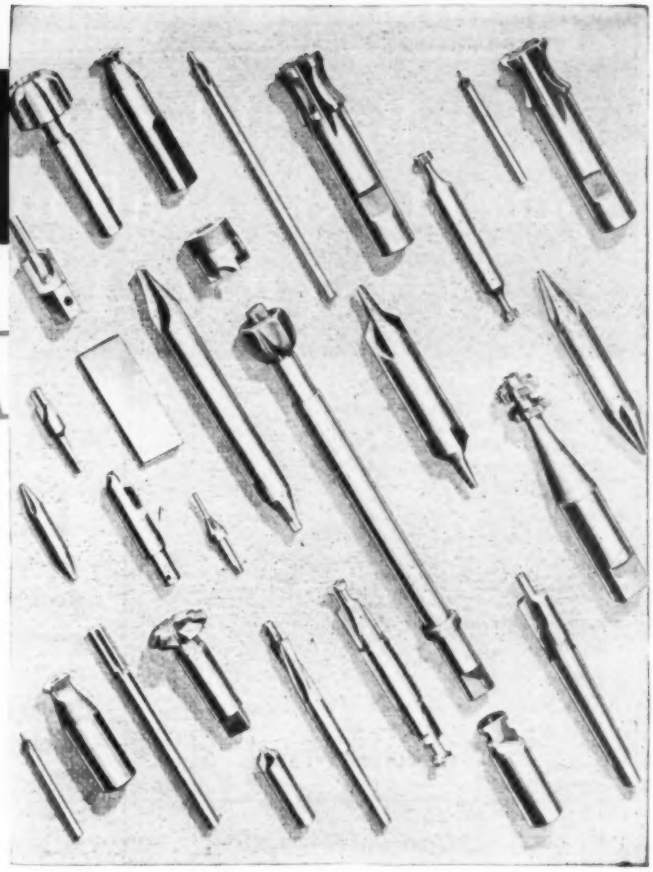
FINE-EDGE CUTTERS



Want high

Edge Strength?

You can get it

with DBL-2 HIGH-SPEED STEEL

Write for copy of

"CUTTING TOOL MATERIALS"

Allegheny Ludlum produces *all* types: the various tungsten and "moly" high-speed steels, cast-alloy materials, and cemented carbides. This 36-page booklet analyzes and compares types, and covers grade selection, etc.—invaluable data for production men. *Write for your copy.*

ADDRESS DEPT. AM-20

A midwestern tool manufacturer, specializing in fine-edge cutting tools, has found DBL-2 *best* for their purpose—added proof of the high edge strength and excellent cutting qualities of this high-speed steel.

DBL-2 (typical analysis: C .80, W 6.00, Mo 5.00, Cr 4.00, V 1.75) represents the 6-6-2 or M-2 type of tungsten-molybdenum high-speed steel. DBL-2 combines high hardness with toughness. Requiring no more than reasonable care in hardening and tempering, you will find it a high-speed steel of great possibilities—capable of giving you performance equal to, or better than, the general-purpose tungsten types, and at reduced cost.

DBL-2 reliability has been proved in a wide variety of cutting tools. Let us help you to use DBL-2 . . . our Mill Service Staff is at your command.

● *Allegheny Ludlum Steel Corporation, Henry W. Oliver Bldg., Pittsburgh 22, Pa.*

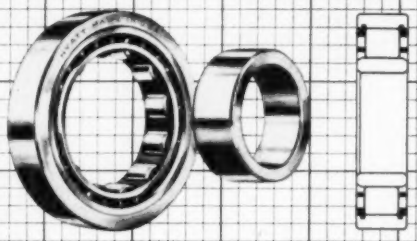
For complete **MODERN** Tooling, call

Allegheny Ludlum

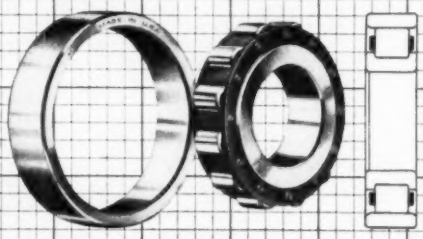
AL FINE TOOL STEELS SINCE 1854

WAD 3639

For Radial Bearings that permit axial shaft movement HYATT HY-LOADS



A-TS TYPE
HYATT HY-LOAD

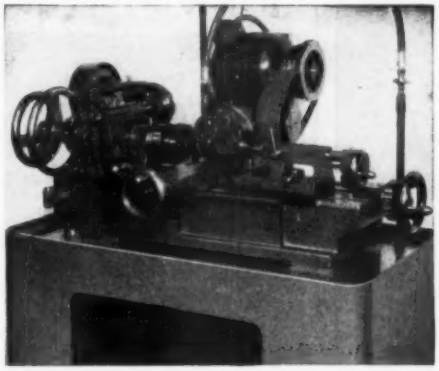


BU-Z TYPE
HYATT HY-LOAD

THE straight cylindrical race in each of the bearings pictured here permits axial freedom of the shaft to accommodate thermal expansion or other limited shaft movement. This is but one of the advantages enjoyed by designers who employ the Hyatt line of Hy-Load Roller Bearings. Others include: option of omitted race operation, complete interchangeability of parts, maximum capacity for standard dimensions—and long trouble-free life.

Full information about all types of Hyatt Hy-Load Roller Bearings is contained in Hyatt Catalog 547... a complete engineering guide to radial bearing selection and use. Write now for a copy. Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey.

HYATT ROLLER BEARINGS



WALTHAM THREAD MILLING MACHINES

. . . for producing accurate, fine-finish threads on small diameters at low cost

This NEW model is mounted on a welded steel base in which are accessibly located control panel, coolant motor and pump. It is equipped with separate motors for cutter, work and coolant. Motor push buttons are conveniently placed.

Swing over carriage is 3" and work 2" diameter or smaller can be handled. Threads $8\frac{3}{4}$" long can be cut with work held on centers. Special attachments are available for extending the utility of this machine. *Illustrated literature available on request.*

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● Split thousandth accuracy and expert craftsmanship insure against the slightest doubt regarding Cincinnati Gear quality and dependability. Custom-built to your specifications. Electronically tested to assure quiet operation.

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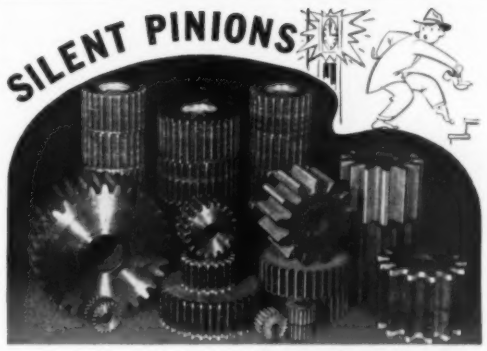

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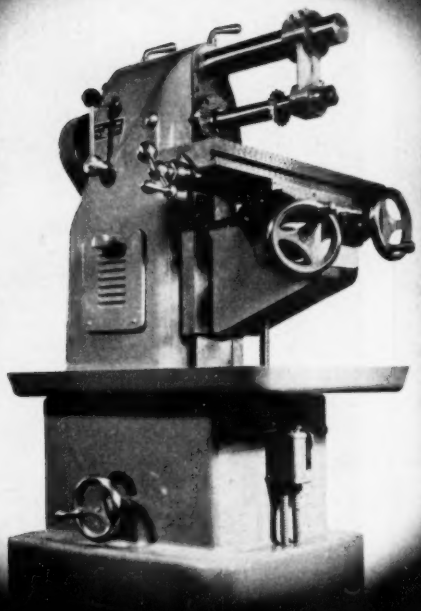

A *better* Milling Machine *from any angle . . .*

It was a popular machine tool as the Vernon Milling Machine even before SHELDON completely re-engineered and improved it . . . added "Precision" Timken Tapered Roller Bearings; added a completely new variable speed type drive, increased the speed range and provided an optional power feed.

Quality-built throughout, in the modern SHELDON plant which was built and specially tooled to make fine precision machine tools, the modern SHELDON Milling Machine is truly "a better milling machine from every angle." Write for catalog.

SHELDON
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Prove it's a MONEY SAVER!

Install one Dodge Slide-Set vise and compare it with the best conventional type vise you have. Check the time it saves your operators. The Dodge Slide-Set eliminates tedious handle-spinning. Jaw slides to desired position—open or closed—in one second.

In some shops Slide-Set has saved as much as 50% of the time consumed in clamping work. It cuts operator fatigue. In addition it has all the ruggedness and stamina required for machine shop and production operations. Ask your Distributor to demonstrate.

DODGE

SLIDE-SET VISE

New, fast, rugged, and revolutionary! 1. Turning handle counter clock-wise throws vise into "neutral" for fast slide action. 2. A push closes jaws on work, (or a pull opens). 3. Turning handle clock-wise applies full pressure conventionally. No-pinch handle protects against blood blisters. Write now for free Bulletin.

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FIRST IN POWER TRANSMISSION MACHINERY

NEED A FASTER METHOD of BENDING PARTS LIKE THESE

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6 COST CUTTING FEATURES OF PINES BENDERS

- Produce Accurate Uniform Bends without marking or distorting.
- Push-Button Control — simple, easy for one man to operate.
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Find out how Pines Benders are designed to save time and cut costs on a wide range of work. Literature described and pictures various models, attachments, and methods on actual jobs.

PINES ENGINEERING CO., Inc.

Specialists in Tube Fabricating Equipment

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New 'HABIT' Diamond Tool Does More Work Better for Less

The **'HABIT'** Index-A-Point has been designed to provide a simple and foolproof method of rotating a diamond through a sequence of seven stations mechanically positioned to present a keen, sharp edge or point to the grinding wheel at each station.

'HABIT' *improves grinding finishes.*

'HABIT' *diminishes diamond consumption more than 30%.*

'HABIT' *reduces diamond re-setting to as little as 1/10th.*

'HABIT' *increases productivity.*

Get the **'HABIT'** Index-a-Point Abrasive Tool Dresser...

Informative literature will be sent on request.

U. S. Patent applied for

EST. 1908 **ANTON SMIT & Co., Inc.**

333 W. 52nd St., New York 19, N. Y. Cables: PROFITABLE, New York

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Here's a NEW tool for YOU!! ...the BOREMASTER

5" Holes in Boiler Plate . . . 80 seconds
Precision within .004"

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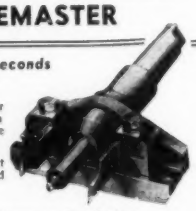

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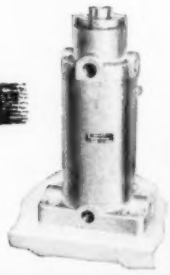

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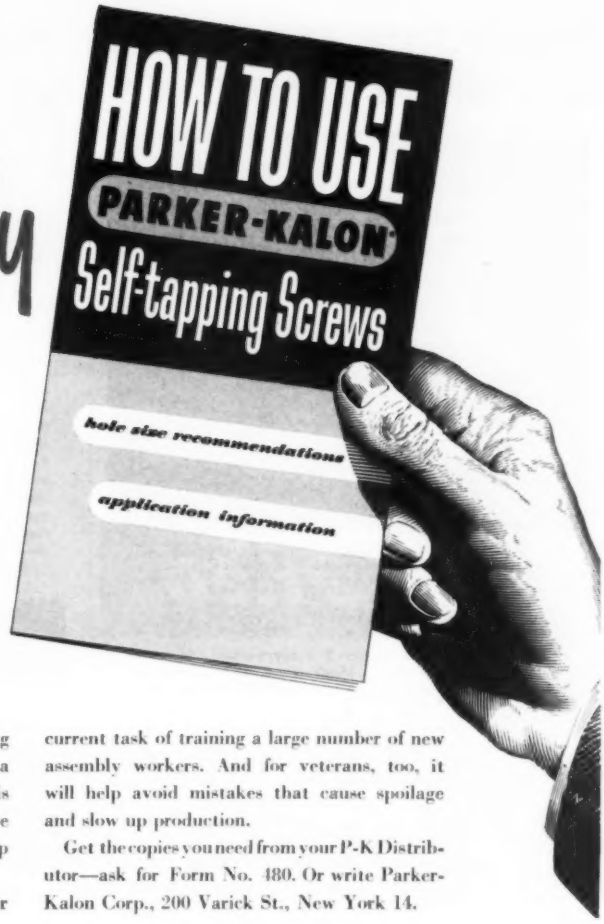

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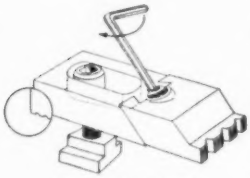

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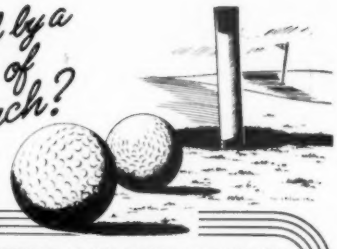

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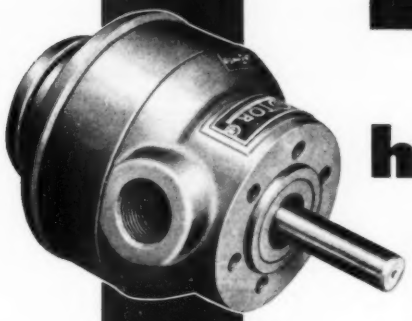

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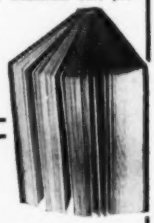

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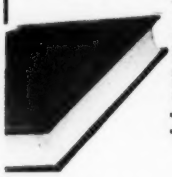

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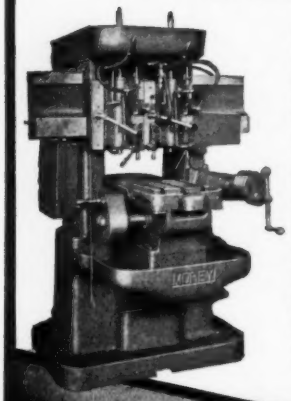

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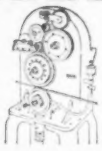
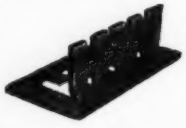


WIRE MARKING MACHINES
FOR MARKING PLAIN OR INSULATED WIRE OR CABLE, WRITE FOR COMPLETE DETAILS OF WIRE MARKING DIES AND MACHINES.
The ACROMARK Company
7-13 MORRELL ST., ELIZABETH 4, N. J.

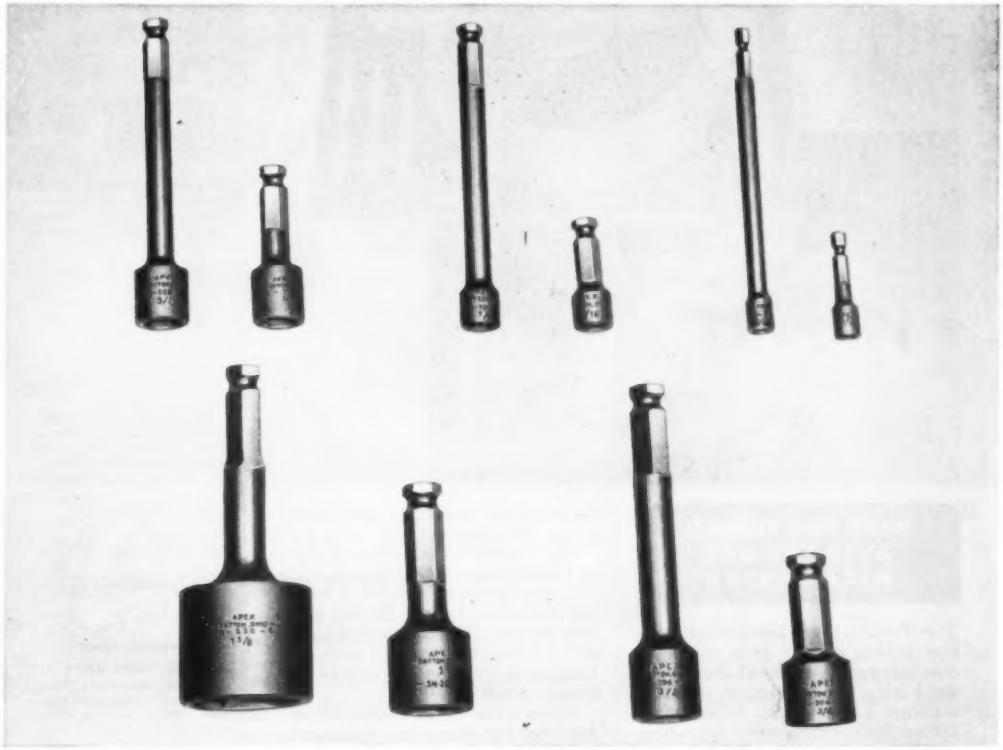


HENRY & WRIGHT
DIVISION OF EMHART MFG. CO.
HARTFORD 5, CONNECTICUT

DIEING MACHINES
(HIGH SPEED AUTOMATIC PRESSES)
HIGHEST SPEEDS — LONGEST DIE LIFE

For increased torque...specify

APEX *SN* NUT SETTERS



• Power—applied straight from gun to work—that's the way Apex *SN* nut setters develop greater torque . . . permit faster, safer operation . . . help lower production costs.

These precision-built, one-piece tools have no movable parts, joints or locking devices to cause excessive torque loss, backlash or vibration. Operation is easier . . . on tools and tool operators alike.

Apex *SN* Series nut setters are available with ¼", 5/16", 3/8", 7/16" and ½" hex drives . . . broached hex openings, ¼" to 1¼" . . . broached square openings, ¼" to ¾". Complete information on Apex *SN* nut setters and other money-saving Apex production tools is available in Catalog 29. Write, on your company letterhead please, for your copy.

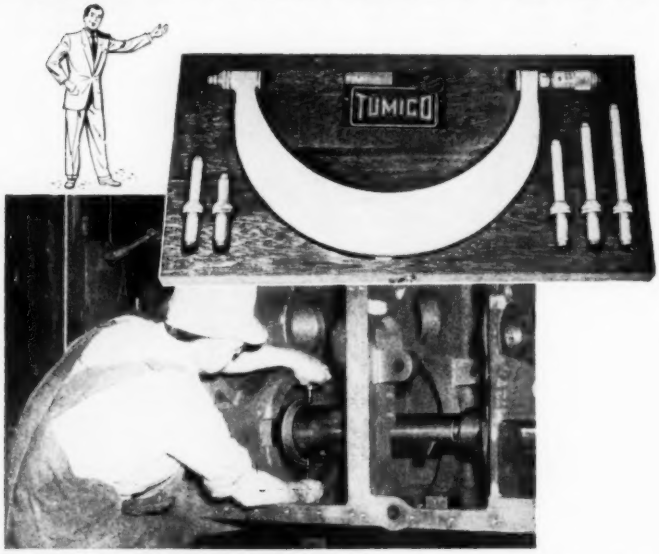
APEX TOOLS

sockets, extensions, adapters

THE APEX MACHINE & TOOL COMPANY
1026 S. Patterson Blvd., Dayton 2, Ohio

SAFETY FRICTION TAPPING CHUCKS • VERTICAL FLOAT TAPPING CHUCKS • SELF-RELEASING AND ADJUSTABLE STUD SETTERS • POWER BITS FOR PHILLIPS, FREARSON, SLOTTED HEAD, CLUTCH HEAD, HEX HEAD AND SOCKET SCREWS • HAND DRIVERS FOR PHILLIPS, FREARSON AND CLUTCH HEAD SCREWS • AIRCRAFT AND INDUSTRIAL UNIVERSAL JOINTS • SOCKETS AND UNIVERSAL JOINT SOCKET WRENCHES.

Get Fast, Accurate Bore Measurement



WITH THE TUMICO OVER-THE-BAR MICROMETER

The Tumico Over-the-bar micrometer makes speedy bore diameter measurements without removing the boring bar or disturbing cutter settings. Light-weight hollow steel frame makes precision measurements easy . . . gives the "feather touch" needed for extreme accuracy! Made in 11 models ranging from 3" to 28", Tumico Over-the-bar micrometers are fully and easily adjustable for wear.

All Tumico micrometers, gages and measuring instruments include advance design principles to measure diameters to 96". Skilled engineering has reduced weights up to 50%. "Feather touch" feel and balance speeds measurements and insures accuracy.

Tumico instruments control production for many of America's largest manufacturers. Consult us for special production gages, calipers, alignment instruments, etc. Catalog sent free on request.

TUBULAR MICROMETER CO.
ST. JAMES, MINNESOTA

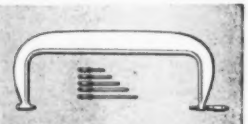
FEATHER TOUCH

SEATTLE • LOS ANGELES • DENVER • DALLAS • CHICAGO • MINNEAPOLIS • KANSAS CITY
DETROIT • ATLANTA • NEW YORK • TORONTO, CANADA • EXPORT OFFICE: CHICAGO

FOR EVERY JOB

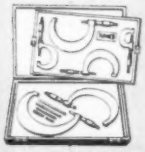
TUMICO

PRECISION MEASURING INSTRUMENTS

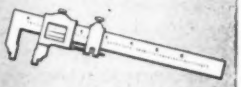


TUMICO BAR MICROMETERS
Provide a wide range of precision measurement with low investment. 30 models from 6" to 168".

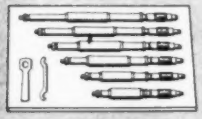
TUMICO DIAL INDICATOR GAGES
Quick vision Tumico micrometers and gages to meet your special measurement requirements.



TUMICO MICROMETER SETS
Complete sets for a broad range of accurate measurement operations. From 0" to 30" in 1" steps.

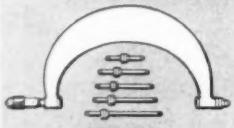


TUMICO VERNIER CALIPERS
Precision made. Accurate, clearly etched graduations and numerals. 24 models from 6" to 48".



TUMICO INSIDE MICROMETERS
Tubular construction; insulated from hand heat for full precision. 37 models from 1" to 106".

TUMICO POST GAGES
Precision micrometer or dial indicator instruments adaptable to a wide variety of uses. 10 models.



TUMICO OVER-THE-BAR MICROMETERS
Precision bore measurement without removing boring bar. 11 models from 3" to 28".

TUMICO HEAVY-DUTY MICROMETERS
Extra rugged for hard usage under severe conditions. 4 models from 0" to 4".

...of Special Interest to HOLE Engineers

HOW AIRFEEDRILL* BROKE A PRODUCTION BOTTLENECK

In producing this small part, a drilling operation kept one worker busy full time. Her output set the pace for the entire production line . . . placed a top limit on output per hour and per day.

The job didn't warrant an extra drill press and operator, so the ingenious shop foreman set up a simple mounting and fixture with a Keller Airfeedrill.*

Now by pressing a valve, holes are drilled as fast as the operator can load and unload the fixture. Castings pass this operation so fast that the worker has time to do other jobs, too. Production of the whole line has increased, and costs have gone down accordingly.

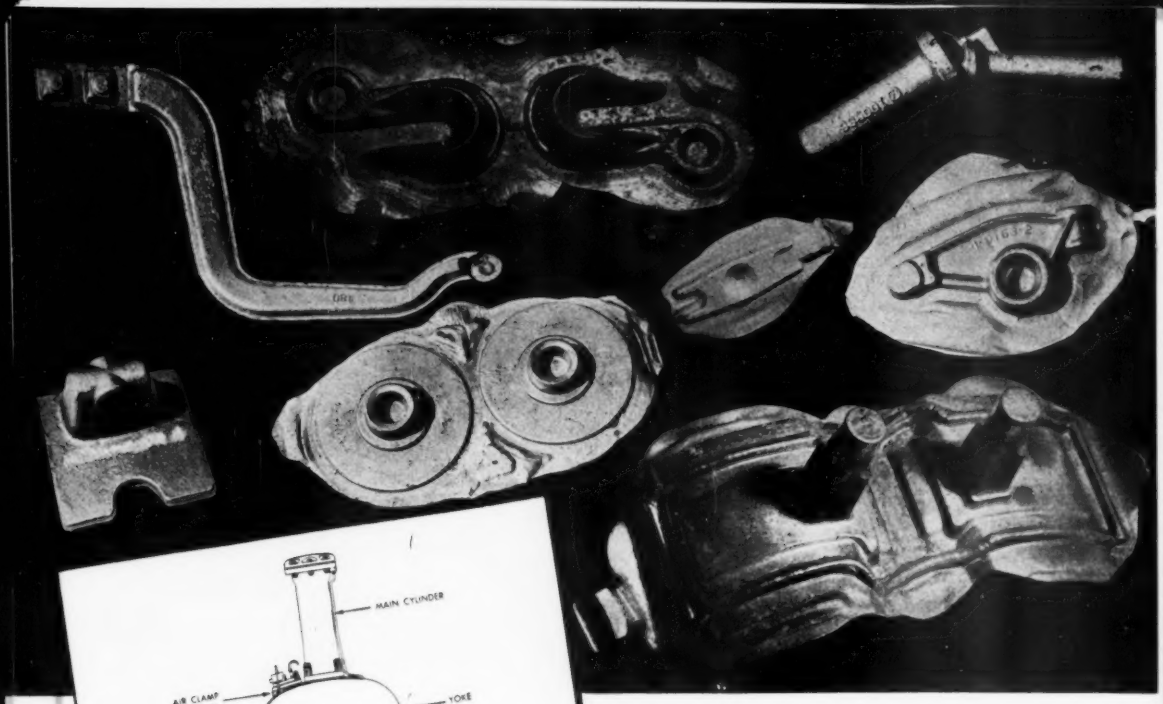
The Airfeedrill can help you speed output of short run or production drilling jobs. A Keller sales engineer will gladly discuss it with you.

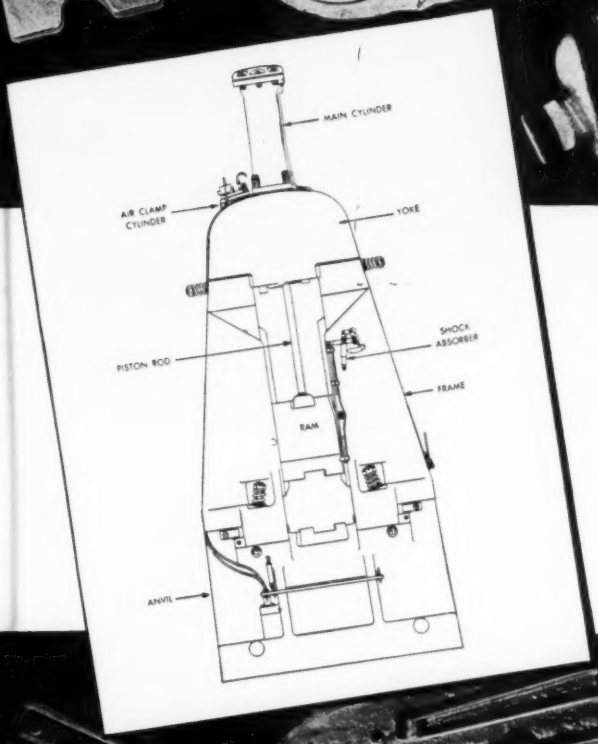
- Assures accurate holes without costly fixtures . . . can be used with existing jigs
- Attaches in any position and supports itself at any angle
- Operates and is controlled entirely by air . . . with pneumatic cycling to speed production, reduce operator fatigue
- Small size permits it to be used on close centers and in tight places
- Accurately drills parts too large for conventional drilling machinery
- Wide range of speeds and strokes will accommodate light or heavy metal, wood, composition, plastic
- Lightweight portable and stationary models are readily adapted to changing job requirements . . . quickly shifted from job to job

* Keller Tool Company Trade Mark

KELLER TOOL COMPANY
GRAND HAVEN, MICH.

KELLER *Pneumatic Tools*





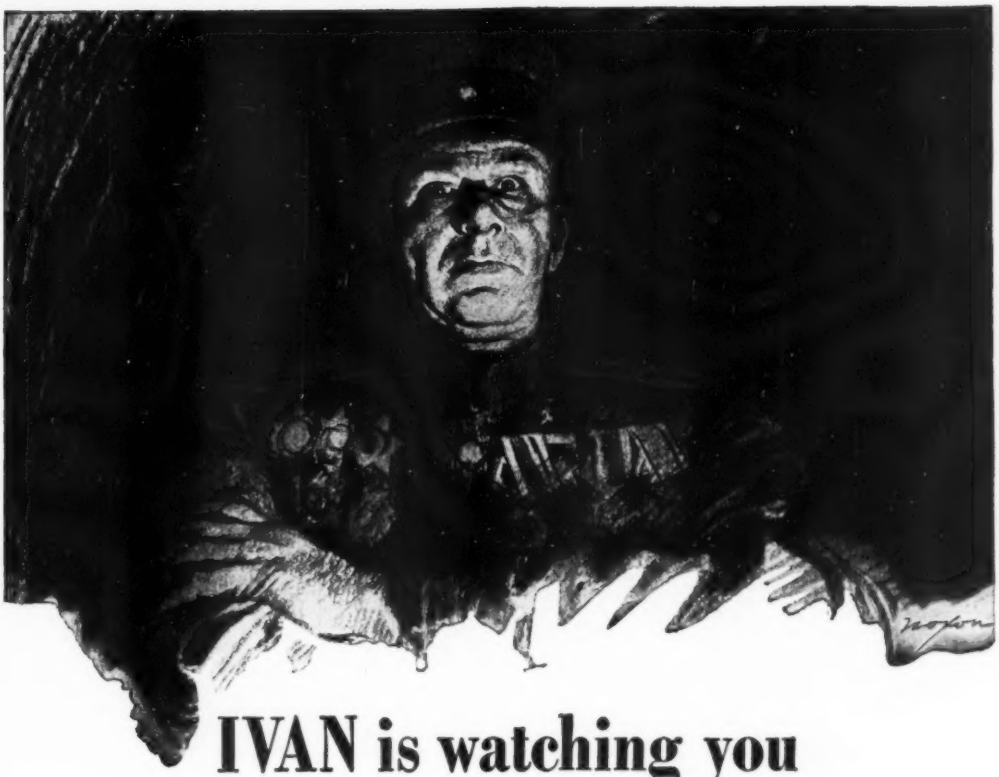
MANY FORGINGS CAN BE MADE FASTER, CHEAPER, MORE ACCURATELY ON THE CECO-DROP

The rapid striking action of the Ceco-Drop, the quick get-away of the ram after striking and the low center of gravity, insuring accuracy of die match, are a few of the reasons why forgings like these have shown increased production, more uniform accuracy and lower costs when transferred from other gravity drop hammers to Ceco-Drops. ***Write for Bulletin 11-L-0***

CECO-DROP

• The Boardless Gravity Drop Hammer •

CHAMBERSBURG ENGINEERING CO., CHAMBERSBURG, PA.



IVAN is watching you

IVAN is a dyed-in-the-wool Communist. There are only 6 million party members like him in all Russia, yet these Communist brass-hats enforce the iron dictatorship of the Kremlin over *200 million* Russians.

He's sold to the hilt on Red ideas. Which means he's out to get *you*. He believes it's either you or him . . . that the world is too small for both.

Ivan is working hard to beat you down. He has a big head start.

Right now he's got you in a bad spot.

Ivan is afraid of only one thing.

He fears your ability to out-produce him in guns, tanks, planes.

Frankly, he doesn't think you value your free system enough to do it . . . to make willingly the sacrifices he has squeezed out of the Russians.

But he's wrong!

Because you and all of us have set out to build more and better weapons—to do it faster all the time.

We must use every bit of know-how and inventive skill we have to improve our machines and methods—to turn out more and more for every hour we work. Only in this way can we become militarily strong.

But we've got to supply essential civilian needs as well. We can't allow needless shortages to take prices skyrocketing and lower the value of our dollar.

Sure, that means sacrifices for everybody. But doing this double job well is the only sure way to stop Ivan in his tracks—and to save the freedoms which are ours and which he has never known.

FREE . . . this important booklet tells you how our American System Grew Great

How Americans developed better machines, power and skills to build a great nation . . . Why we have been able to produce constantly more per hour . . . How this has given us the world's highest living standard.

How we can meet today's challenge—Why we must expand our productive capacity . . . supply arms and essential civilian needs, too. Read how this dynamic process works in free booklet, "The Miracle of America," endorsed by representatives of management and labor. Send for your free copy today!

MAIL THE COUPON—
The Advertising Council, Inc., 25 West 45th St., Dept. B. P. New York 19, N. Y.

Name_____

Address_____

Occupation_____

This advertisement, approved by representatives of management, labor and the public, is published in the national interest

McGRAW-HILL PUBLISHING COMPANY

THE BETTER WE PRODUCE
THE STRONGER WE GROW

SEARCHLIGHT SECTION

(Classified Advertising)

EMPLOYMENT: BUSINESS: "OPPORTUNITIES" :EQUIPMENT :USED OR RESALE

UNDISPLAYED — RATES — DISPLAYED

$1.20 per line, minimum 3 lines. To figure ad vance payment count 5 average words as a line Individual Employment wanted advertising ½ the above rate payable in advance.

Box Numbers—counts as 1 line.

Discount of 10% if full payment is made in advance for 4 consecutive insertions.

Individual Spaces with border rules for prominent display and advertisements.

The advertising rate is $10.50 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

An advertising inch is measured ⅞" vertically on a column—3 columns—30 inches to a page.

MECHANICAL DESIGNER

Large, well-established mid-western tool manufacturer is seeking an *experienced* machine designer (not a draftsman) familiar with hydraulic and electronic motions. Position is permanent and offers a splendid opportunity for a graduate engineer who can not only design his own machines but also develop the designs of others.

Please apply by letter giving full information on education, experience, references and compensation.

P-1028, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

REPLIES (Box No.):
Address to office nearest you
NEW YORK: 330 W. 42 St. (18)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITIONS VACANT

WANTED SENIOR Draftsman or junior designer with 5 years or more board experience preferably on rotary machinery. Steam turbine or centrifugal pump experience desirable. Old established Company not dependent on war work. Salary open. Replies confidential. Write fully history experience. Dean Hill Pump Company, Indianapolis 5, Indiana.

ENGINEER. THOROUGHLY experienced in mechanization and elimination of hand operations. Also with production experience in mass produced, low cost electronic assemblies, preferably with direct experience in the manufacture of radio rotary switches, or volume controls. P-1238, American Machinist.

WANTED YOUNG man for steel sales work. Desirable to have some technical training and experience in metallurgy or metal working. Need not have engineering degree. Opening in Buffalo territory. Give details of education, experience, and starting compensation expected. P-1255, American Machinist.

EMPLOYMENT SERVICE

SALARIED POSITIONS $3,500 to $35,000. We offer the original personal employment service (established 41 years). Procedure of highest ethical standards is individualized to your personal requirements. Identity covered; present position protected. Ask for particulars. R. W. Bixby, Inc., 266 Dun Bldg., Buffalo 2, N. Y.

POSITIONS WANTED

MAINTENANCE OR MACHINE Shop Supt. 20 yrs. experience Production Tooling, Plant layout, steel fab., Yoder mills, T.W.I. training safety. Public Relations. Ohio location. PW-1395, American Machinist.

EXECUTIVE: QUALIFIED to assume full responsibility as Plant Manager, Shop Supt. or Assistant Supt. 22 yrs. diversified machine shop experience in job shops manufacturing and erecting of heavy precision machinery, familiar with modern machine shop methods, ranging from blue print stage, through processing, design, tooling, estimating, & labor relations. PW-1482.

PATENT ATTORNEY

Consult: Z. H. Polachek

Reg. Patent Attorney, 1234 Broadway, New York 1, N. Y.

CHIEF INSPECTOR WANTED

Familiar with pumps and allied machinery and capable of taking charge of Inspection Department. Preferably about 35 years of age. Eastern location; permanent position. Give full details in first letter.

P-1087, AMERICAN MACHINIST
330 W. 42 St. New York 18, N. Y.

Bids wanted by August 22, 1951

To furnish new medium size machine tools in exchange for used heavy machine tools.

Sundstrand drilling and centering machine, Bullard vertical turret lathe, Farrell-Birmingham Sikes gear generator, and Gisholt 3L saddle type turret lathe.

The right is reserved to reject any and all bids.

For particulars address Comptroller,

A. and M. College of Texas
College Station, Texas

WANTED—AT ONCE!

Excello—6" Vertical Shell Turning Lathe—Model 724. Must be rough turning machine with 4 turning tools on right hand side and two facing tools on left hand side.

U. S. HOFFMAN MACHINERY CORP.
Auburn Division, Auburn, N. Y.
Att: H. A. Kenyon Phone Auburn 3-7317

Are You Seeking or Offering

— business

— equipment

— employment

"OPPORTUNITIES"?

To fill any of these "industry wants" a logical source is found in this Searchlight Section—Classified Advertising.

Experience has shown that the Searchlight Section produces quick results because it spotlights current opportunities of special interest to the readers of AMERICAN MACHINIST—management and production executives in the metalworking industry.

Use "Searchlight"—at low cost—to feature your wants or offerings . . . whether it concerns employment, buying or selling used or surplus new equipment, or other pertinent business "opportunities."

CONTRACT WORK

PATTERNS in WOOD and METAL
For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us – we will take care of them.
GENERAL PATTERN WORKS
2233 Beck Street Cincinnati, Ohio

SEARCHLIGHT SECTION

FOR SALE

4—Whiting Portable Electric 35-Ton Screw Jacks complete with 7½ HP, 220/440 volt, 3 phase, 60 cycle motors and control. Lift 4'3". Mounted on rubber tired wheels. These jacks are brand new and offered on account of change in manufacturing plans

W. R. SPRAGUE
Purchasing Agent
American Hoist & Derrick Company
63 South Robert Street
St. Paul 1, Minnesota

FOR SALE

Kearney & Trecker Model 2A Autometric Boring and Milling Machine.

Serial 4/4052. Standard Arrangement, Standard Equipment, 220/3/60 current, including 1 set (9 colletts) ⅛" through ½".

Immediate Delivery
Call: Norwalk 8-6518
or write to

National Cored Forgings Co., Inc.
Box 119 So. Norwalk, Conn.

Turret Lathe, NEW #4 Morey, with A. C. electrical equipment.
Peerless 10" x 10" Universal Power Saw with A. C. Motor.
Milling Machine, B & S #5B, plain, with A. C., 20 HP Motor, V-Belt Drive.

GUYAN MACHINERY COMPANY
Logan, W. Va.

FOR SALE

No. 1½ Buffalo Universal Ironworker
COPER & NOTCHER NEW IN 1947

ALEXANDER & FIDEN
1014 Genesee St. Buffalo, New York

FOR SALE

Worthington 2 x 12 Tri-Stage Pump. Serial #283412.

COMPLETELY REBUILT. LIKE NEW

AMERICAN SWISS PARTS CO.
245 So. Schaefer Hgy. Detroit 25, Michigan
TEL. WARWICK 8-7050

MACHINERY FOR SALE
ATTENTION EXPORTERS!

Unusual opportunity to procure modern Fellows Gear Shapers 615A and 645 as well as 12" Gleason Generators, 36 HM Gould & Eberhardt Rougher, #7 Fellows Gear Shaper, #16 D. E. Wilton Machine. Write for full information.

FS-1833, AMERICAN MACHINIST
330 W. 42 St., N. Y. 18, N. Y.

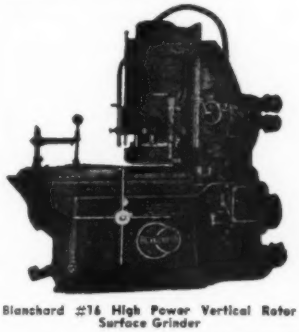
BUY FROM STOCK
Telephone
BAKER 5887

FALK
MACHINERY COMPANY

10 WARD ST.
ROCHESTER 5
N. Y.

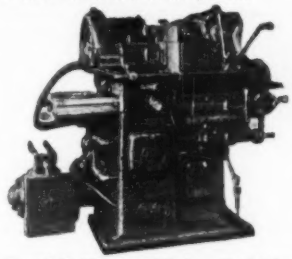
Every Item Guaranteed as Represented

AUTOMATIC, Cleveland Model #B-1½" Sgl. Spdl.
AUTOMATIC, B & S #2G, 1" High Speed.
AUTOMATIC, #33 Acme-Gridley 4-Spdl. 1" Cap.
AUTOMATIC, National-Acme Sgle. Spdl. 4½".
BORING MILL, Lucas #31 Horiz. 3" Bar.
BORING MILL, Giddings & L #32 Horiz. 3½" Bar.
BORING MILL, Ryerson #11 Horiz. #6 M.T.
BORING MILL, King 42" Vertical. A.C. Motor Dr. Power Rapid Traverse with side head.
BORING MILL, #0 Giddings & Lewis, 3½" Bar.
BORING MILL, Bullard 36" Rapid-Prod., M.D.
BORING MILL, Bullard 24" Rapid-Prod., M.D.
BORING MILL, Cleveland Horiz. 2½" bar, cap.
BOREMATIC, Heald #49 Sgle. End, & D. E.
BRAKE, Verson Press T15-10, 10'x½" cap.
BROACH, Oilgear Hydr. 10 Tons Horiz. 56" Str.
COMPRESSOR, Chicago Pneumatic 178 CFM.
COMPRESSOR, Ingersoll Rand 173 CFM.
CHIP WRINGER, Barrett #251, M.D., 18" dia.
CUTTER, 74" Oswego Automatic Paper, M.D.
RADIAL DRILL, Fosdick 5' Arm, 14" Col. #5 M.T.
RADIAL DRILL, Carlton 4'-15". Motor on Arm.
RADIAL DRILL, Cincl.-Bickford 3½x9", A.C., M.D.
RADIAL DRILL, Cincl.-Bickford 5' arm, 18" col.
DRILL, Deep Hole, Avey-Draulic #2.
DRILL, Deep Hole, Pratt Whitney #2 Gun Barrel
DRILL, Edlund #2B, 3 spdle. #2 M.T., 18".
DRILL, Cincinnati 21" with Tapping Attach.
DRILL, Natco Multiple Spindle #12, #1 M.T.
DRILL PRESSES, Leland Gifford #1MS, 1, 2, 3, 4
DRILL PRESS, #2MS Buffalo Forge single spindle.
DRILL PRESS, #25 Foote-Burt S.S. 24", #5 M.T.
DEEPFREEZE, Cascade 120° F., Industrial Chilling
FILING, #3 Thiel & Sewing, M.D.
GRINDER, Disc, Besley #205, 18" Dble. End
GRINDER, Artar 16" Rotary Surface.
GRINDER, Cylindrical, Brown & Sharpe #2 Uni.
GRINDER, Hammond #14W Carbide, Dbl. End.
GRINDER, Oakley #3 Univ. Tool & Cutter.
GRINDER, Sellers #1A Hvy. Duty Tool.
GRINDER, G & L #4 Univ. Tool & Cutter
GRINDER, Heald Rotary #25.
GRINDER, Hydraulic Contour Landis Cam 5"x40".
GRINDER, Cylindrical, Norton 10"x24".
GRINDER, Brown & Sharpe #4 Univ. 12"x80".
GRINDER, Brown & Sharpe Cylindrical #10, 6x18.
GRINDER, Cylindrical, Cincl. 6x18 Filmatic.
GRINDER, Thread, Jones & Lamson #TG-615
GRINDER, Landis Crankshaft 10x32 Hydraulic.
GRINDER, Brown & Sharpe #2 Auto. Horiz. Surface
GRINDER, Cincinnati 10x36, cylindrical, filmatic
GRINDER, Heald #72A-3 Internal Size-Matic.
GRINDER, Norton 6x18 Hydr. Vert. Late Type
GRINDER, Pratt & Whitney 14x36 Vert.
GRINDER, Pratt & Whitney 22"x84" Vert.
GRINDER, Springfield #2 Planer Type Surface.
GRINDER, Brown & Sharpe #13 Univ. Tool



Blanchard #16 High Power Vertical Rotor Surface Grinder

GRINDER, #51 Oliver Auto. M.D. Drillpointer.
GRINDER, #33 Abrasive Vert. Auto. Surface.
GRINDER, #2 Cinc. Centerless M.D.
GRINDER, #22 Heald Horiz. Rotary Surface.



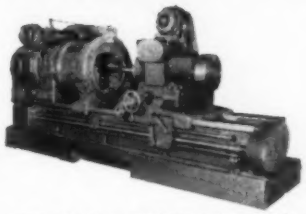
Greenfield #12 Internal Hydromatic Grinder

GRINDER, #2 Norton Cutter & Tool, late.
GRINDER #1 Moore Jig, Late Type, M.D.
GEAR HOBBER, #3 Barber Colman, M.D.
GEAR HOBBER, B & S #34 Spur, 18" dia.
GEAR SHAPER, Fellows #6 High Speed.
GEAR SHAPER, Fellows #72 High Speed.

BENDING ROLLS

Hilles & Jones #6 Pyramid Type Motor Driven Plate Banding Rolls. Size—14'x¾" Plate. Top roll—22" dia. Lower rolls—15" dia. Imm. Deliv.

GEAR SHAPER, Fellows #7 High Speed.
HAMMER, Rochester Hispeed, all sizes M.D.
HAMMER, Bradley 200# Rubber Cushioned Helve.
HEADER, Manville #1 S.S.S.D. Cold, 3/16".
HEAT TREAT TOOM, complete with Furnaces.
JIG BORER, Linley M.D., hispeed, late type.
KEYSEATER, #5 Mitts & Merrill, Giant, M.D.
LATHE, Buffing Dble. End #VMT5, Devine Bros.
LATHE, Pond 36"x108" Grd. Hd. With Equip.
LATHE, Bridgeford 32"x16' Q.C.G. Grd. Hd.
LATHE, Niles 30"x40' Grd. Hd. with Equip.
LATHE, Bridgeford 20"x18' Q.C.G. Grd. Hd.
LATHE, Lodge & Shipley 24"x8' Heavy Duty.
LATHE, LeBlond 24"x14' Q.C.G. Grd. Hd.
LATHE, American 20"x10' Q.C.G.
LATHE, Hendey 20"x10' Q.C.G., Taper Att.
LATHE, Reed-Prentice 20"x10' Grd. Hd.
LATHE, Lodge & Shipley 18"x8', Q.C.G., Gr. Hd.
LATHE, American 18"x10' Q.C.G., Grd. Hd.
LATHE, American 16"x6' Q.C.G. Grd. Hd.
LATHE, LeBlond 16"x6' Q.C.G. Taper Attach.
LATHE, Lodge & Shipley 16"x6', Q.C.G., Grd. Hd.
LATHE, Hendey 14"x8' Q.C.G. Taper Attach.
LATHE, LeBlond 14"x6' Q.C.G.
LATHE, Hendey 12"x5' Q.C.G. Taper Attach.
LATHE, Le-Swing 8"x108", M.D., A.C.
LATHES, TURRET, Warner & Swasey Univ. #4 1⅛".
LATHE, TURRET, Warner & Swasey #3A Univ. Grd. Hd. Bar feed, tooling & collets, AC Motor.
LATHE, TURRET, Simmons #2 Varl Drive 220 V.
LATHE, TURRET, Warner & Swasey #6 Grd. Hd. Ram Type, Bar Feed, Motor in base.
MILL, 2A Brown & Sharpe Horiz. Univ.
MILL, #4B Brown & Sharpe H.D., Horiz.
MILL, #14 Garvin Plain Horiz.
MILL, #0Y Brown & Sharpe Plain Horiz.
MILL, Bridgeport Model #BH, M.D.
MILL, Van Norman M.D. Hand Mill, late.
MOTOR GENERATOR SET, 100 KW Gen. Elec.
MILL, Cinc. Horiz. #2, #3, #4, #5, High Power.
MILL, Cinc. Vert. #2, #3 #4, High Power.
MILL, Sundstrand #0 Hyd. Rigidmill.
MILL, Cinc. 18" Mfg. Type with Vert. head.

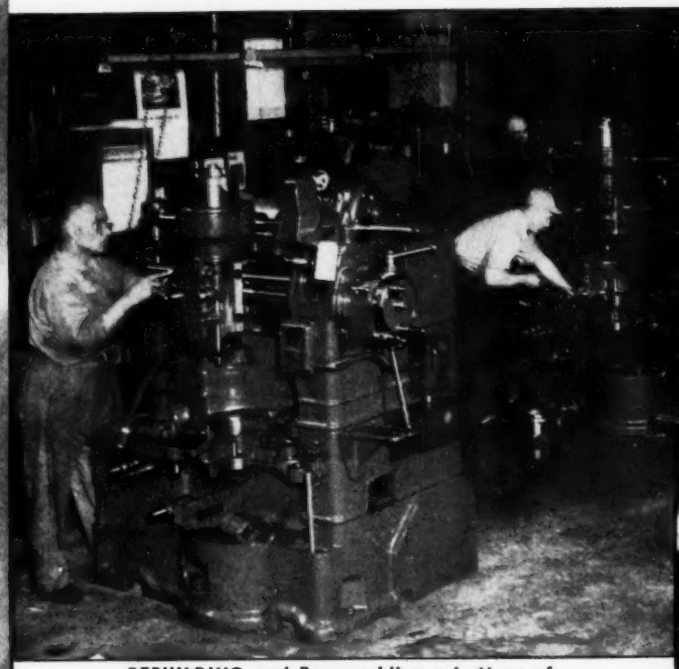


Sommer & Adams #20A Threading, Hobbing & Boring Machine, swings 36", 42" centers, 18" cross feed, last use threading breech blocks on 105 MM guns.

MILL, #14 Cochrane-Bly Vert. Duplex Univ. Shaper.
MULT-MILLER, U.S. Tool #MM-1-0, Auto. Prod.
MILL, #30H Sundstrand Two Spindle Hyd.
MILL, #1-M Kent-Owens M.D. Plain Horiz.
MILL, PLANER, Ingersoll 42x36x12, 4 heads.
MILLING MACHINE, Kempsmith #3, Horiz. Univ.
MILLING MACHINE, LeBlond #4 Horiz. Univ.
MILLING, Brown & Sharpe #1½ Horiz. Univ.
MILLING MACHINE, Kempsmith #2 Horiz. Univ.
MILLING, Brown & Sharpe #2 Horiz. Univ.
MILLING MACHINE, Van Norman #2 Duplex.
MILLING MACHINE, Cincinnati #00 Prod., Vert.
MILLING MACHINE, Cincinnati #00 Prod., Horiz.
MILLING MACHINE, K & T #2B, Horiz.
MILLING MACHINE, Nichols Hand Millers.
NIBBLER, #2 Savage Roller Die ¾"x36" cap.
NIBBLER, Gray Turret Type 1¼"x24" cap.
THREADING, Staybolt Lassiter Millholland 1½".
THREAD MILLER, Hansen Whitney 4"x9" Univ.
THREAD MILLER, Lees Bradner #40A Automatic
THREAD MILLER, Plan-O-Mill #3 Planetary Form & Thread Semi-Automatic Milling Machine.
PLANER, Gray 30"x30"x10' A.C. Motor Dr.
TAPPER, W & S #1 Sgle. Spdle.
POWER PRESS, Bliss #164 Open Back.
POWER PRESS, Bliss #3A S.S. Dble. Crank Grd. 45 tons, 4" stroke, 36"x24" Bed Area.
POWER PRESS — Bliss - Consolidated #163 - B Straight Side Dble. Crank, 45 tons.
PRESS, V & O #4 O.B.I. 38 tons.
PRESS, Robinson #5 O.B.I. 88 tons.
PRESS, Federal #2 O.B.I. Grd. 2" Stro.
PRESS, Bliss #18, #19, #20, #21, OBI, A.C., M.D.
PRESS, Toledo 58¼ S.S. 440 ton cap. 8" str. bed
PRESS, Waterbury-Farrel High Speed 60 tons #3W.
PRESS, 66CBliss Double Action, 3 crank.
WHEEL PRESS, Caldwell 200 tons cap. Hyd.
PRESS, Lucas 15 tons Power Arbor M.D.
PRESS, #6B Whitney Deep Thr. 24", foot.
PANTOGRAPH, #1A Gorton M.D. Engraving.
PUNCH, Hecker Turret, 6 station, cap. 2½" hole.
PUNCH, H & J #2 Sgle. End, 24" Thr. 1" thru 1".
PUNCH, H & J #3 Sgle end, 48" Thr. 2" thru 1½".
PUNCH, H & J #6 Sgle end, 72" Thr. 1¾" thru, 1¼"
ROLLS, #1 Buffalo Forge Wrapping.
CUT-OFF SAW, Yates-American #M-90.
SAW, #302 Campbell Abrasive Cut-off.
SAW, #20-C Racine Shear Cut 6"x6" cap.
SAW, N518-10 Grob Band & Butt Welder.
SAW, Band, Tannewitz #GH-36" High Speed.
SHAPER, 32" Cinc. S.G., Motor driven.
SHAPER, Columbia 32" S.G. Crank.
SHAPER, Morton 36" Draw-Cut, 4-Speed.
SHAPER, G & E 24", high duty, back geared, M.D.
SHEAR, Quickwork #A-1 Rotary 90° Throat, 18 ga.
SPRUE CUTTER, Milwaukee 50 tons, 2½" cap.
SCRAPER & SPOTTER, Anderson Bros., M.D.
SURFACE PLATES & TABLES, all sizes.
WELDER, 200 KVA Federal, Projection.
WELDER, 75 KVA Federal, M.D., Spot.
WIRE STITCHER, Morrison and Acme, M.D.

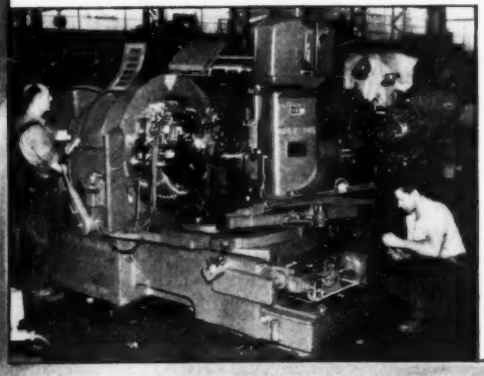
OVER 2000 MACHINE TOOLS AVAILABLE "IN STOCK"

PRECISION REBUILDING·



REBUILDING and Reassembling a battery of GEAR SHAPERS

Hand Scraping in a Slide on Fellows Gear Shaper



Rebuilding Gleason Gear Grinder — Preparing Machine for Final Test

Dismantling Cleveland Automatic Screw Machine for Rebuilding — from the ground up.

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150,000 sq. ft. of floor space

Your present equipment can be REBUILT to NEW-TOOL ACCURACY to meet present-day exacting productivity demands by

AMERICA'S FINEST REBUILDING FACILITIES

In a modern, well-equipped plant, set up *exclusively* to recondition machine tools, with more than 40 years of experience and "know-how" at your service! Our unconditional guarantee eliminates every rebuilding risk.

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Should the Government deliver machine tools to you from Government Reserves, our facilities are available to convert the equipment to "new-tool" accuracy.

NOW IS THE TIME . . .

Deliveries on new equipment are very long—Why lose any time when you can put your present equipment into equal-to-new condition and have them in production for you.

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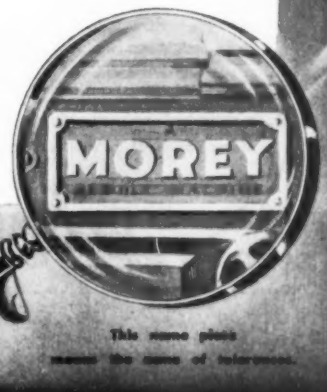

This name plate means the name of tomorrow.

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CABLE ADDRESS: WOODWORK, N.Y.

Eastern Rebuilt Machine Tools

THE SIGN OF QUALITY—THE MARK OF DEPENDABILITY

SHAPERS

16" Queen City H.D. Back Geared Crank Shaper, cone
16" Smith & Mills Plain Crank Shaper, cone
24" Potter & Johnston, cone
32" Morton Draw-Cut, m.d., late
36" Morton Draw-Cut, m.d., late
48" stroke Heavy Duty Morton Traveling Head Draw-Cut Shaper, m.d., with d.c. variable voltage equipment, 12' bed, latest type

SLOTTERS

10" Newton, cone
12" Bement-Niles, m.d.
15" Canada, m.d.
20-24" Dill, m.d.
48" Niles-Bement-Pond Geared, m.d.

TURRET LATHES AND SCREW MACHINES

No. 1 Cincinnati-Acme, Semi-Universal, m.d., chucking, Timken
No. 1L Gisholt, m.d., Timken
No. 2 Pratt & Whitney Shavers, m.d.
No. 2B Foster, m.d., Timken, late type
No. 2F Foster Fastermatic, m.d., Timken
No. 2L Gisholt, m.d., chucking and long bed, Timken
No. 3 Cincinnati-Acme Full Universal, m.d., chucking
No. 3 Foster Geared Head, m.d., bar
No. 3B Foster Universal, m.d., bar
No. 3F Foster Fastermatic, m.d., Timken
No. 3L Gisholt, with cross sliding turret
No. 3L Gisholt, m.d., 1942 machine
No. 3A Warner & Swasey Universal, m.d., chucking
No. 4R Cincinnati Acme, m.d., bar
No. 4 Warner & Swasey Plain, cone, bar and chucking types
No. 4 Warner & Swasey Universal, m.d., chucking
No. 4A Warner & Swasey Universal, m.d., chucking
No. 4FU Foster Fastermatic, m.d., latest
No. 5 Warner & Swasey, m.d., bar, Timken
No. 7 Bardons & Oliver, cone
⅝" Pratt & Whitney Hand Screw Machine, cone
2½x24", 3x36", 3½x32", 4x34" Jones & Lamson Geared Head, m.d., bar and chucking types
3¼" Cincinnati-Acme Geared Head Flat Turret, chucking and bar types
18" Libby Type A, m.d., chucking
20" Acme, s.p.d., bar
20" Acme, cone
28" Gisholt, cone
26" Libby Type C, m.d., chucking
No. 5 Woods Tilted Turret, Model D, cone

SHEET METAL MACHINERY

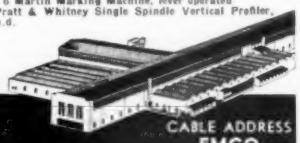
No. 3 Hilles & Jones Plate Bending Rolls, m.d.
No. 2 Campbell Nibbler, m.d.
Gray Turret Head Metal Cutter, cap. ¼", 36" throat
No. 2 Libert Nibbler, 28" throat
Southwark Rotary Metal Cutter, 36" throat, m.d.
120" No. 100 Niagara Heavy Production Folder, 16 ga., m.d.
No. 3—⅝ cap. Gray Sheet Metal Cutter, m.d.
8' No. 196 Robinson Power Squaring Shear, m.d.

TAPPERS

2 spindle Haskins, pneumatic control, type 3 CAP
Murchey Tapper, m.d., 6 to 2 pitch
No. 1 Bakewell Precision, m.d.
No. 1R Bakewell Precision Radial Tapper, m.d., latest
Baush Radial Drilling & Tapping Machine, m.d., latest
No. 5 Webster & Perks, belt

MISCELLANEOUS

2" Acme All Steel Heading, Upsetting & Forging Machine, m.d.
No. 2 Baker Keyseater, m.d.
No. 4B Nazel Air Hammer, m.d., with compressor built-in
Model PH 1 Brinell Hardness Tester, m.d.
Gorton Munitions Engravers, hand operated
Gisholt Precision Balancing Machine, m.d.
Detrick & Harvey Profiler, 2 spindle
No. 12 Pratt & Whitney 2 spindle Profiler, m.d.
No. 20 PH A.D. Cook Deepwell Pump with Chrysler Engine
Wagner Saw Sharpener, m.d.
Gogan Hardness Tester, Model 1618
Logan Hydraulic Vertical Shaver, m.d.
No. 1 Fischer Oil Groover, m.d.
LeRoi Electric Power Plant
American Aircraft Motor Generator Set, Model MASO 104
30 KW Federal Spot Welder, type No. 432 B
54"x11' Rectangular Table, 40" high
Cast Iron Bed Plate, 84x120", 1" T slot
Floor Plate 21' long, 48" wide, 12" thick
Floor Plate, 76" wide, 21'8" long, 9" thick
No. 2 Cochran Bly Filing Machine, pedestal type, belt drive
Richie Hardness Tester, cap. 3000 kgs.
Dwight Slate Machine Co. Marking Machine, hand operated
No. 1I Cochran Bly Saw Sharpener, belt
No. 11S Cochran Bly Saw Sharpener, belt
1 ton Shaw Electric Cable Hoist
Portable Greasing Machine, motor operated
No. 6 Martin Marking Machine, lever operated
30" Pratt & Whitney Single Spindle Vertical Profiler, m.d.



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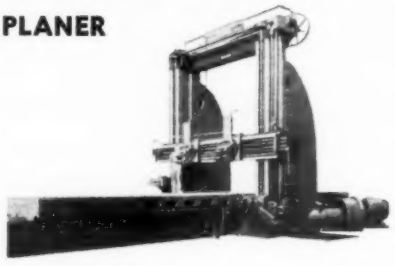
1004 Tennessee Avenue, Cincinnati 29, Ohio
MElrose 1241
CABLE ADDRESS EMCO

AVAILABLE FOR IMMEDIATE DELIVERY

12'x12'x30' SELLERS DOUBLE HOUSING PLANER with four heads;



72"x56"x32' CINCINNATI DOUBLE HOUSING PLANER: 2 heads on cross rail, 2 side heads

72"x72"x22' CLEVELAND OPENSIDE PLANER: 2 swivel heads on rail, 1 swivel side head

60"x48"x12' LIBERTY OPENSIDE: Power elevation, 2 heads

UNUSUALLY FINE SELECTION OF LATHES

60"x19' c/c HOUSTON, STANWOOD, GAMBLE Q.C.; 30' bed
54"x18' c/c HOUSTON, STANWOOD, GAMBLE Q.C.; 28' bed
50"x20' 4" c/c PITTSBURGH Geared Head Q.C.G.; 29' bed
42"x24' c/c BRIDGEFORD Geared Head Q.C.; 32' 3" bed
42"x17' 6" c/c HOUSTON, STANWOOD, GAMBLE Geared Head Q.C.; 26' bed
42"x16' c/c BRIDGEFORD Geared Head Q.C.; 24' bed
36"x30' c/c BRIDGEFORD Geared Head Q.C.; 38' 2" bed
24"x6' c/c AMERICAN HIGH DUTY; 12' bed

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Latest Types — Guaranteed Machine Tools 1941-1950 Models

BROACHING MACHINES

CINCINNATI: 2-36 Vertical Broach, 2 ton, 36" stroke

CAM MILLERS & GRINDERS

VAN NORMAN: Contour Miller 10CT

DRILLING MACHINES

ALLEN: #2 High Speed, 15" overhang
BARNES: 201¼ 2-spindle on 3-spindle base
BAKER: 217 Upright Heavy Duty, 2" capacity
FOSDICK: No. 4BM Upright, High Speed
PROVIDENCE ENG: FV-8 Sensitive 6 motor-driven spindles, ⅜" capacity
PRATT & WHITNEY: ⅛D x 80 Deep Hole Reaming Machine
ARCHDALE: Radial, all sizes (New)

ENGRAVING MACHINES

DECKEL type—3 dimensional (New)
GORTON: 3U & 3Z, 2 dimensional
GORTON: 3B, 3 dimensional

GEAR CUTTING MACHINES

BARBER-COLMAN: No. 3 Hobber
BROWN & SHARPE: No. 6 Gear Cutter, 72" diameter, 1¾ D.P. capacity
FELLOWS: 61A Shaper, 18" dia. capacity
FELLOWS: 64A Shaper, 18" dia. capacity
FELLOWS: 72 Shaper, 7" dia. capacity
FELLOWS: Straight Line Generator, 3" dia.
GLEASON: #12 Rough & Finish Generator
GLEASON: 3" Straight Bevel Gear
HAMILTON: No. 1 Hobber, 8" diameter
SYKES: Gear Shaper 14" external, 20" internal
SYKES: Rack Cutting Machine 24" long (New)

GEAR AND SPLINE GRINDERS

PRATT & WHITNEY: 10" single and double wheel, hydraulic feed
GEAR GRIND MACH: GG-19, 10"x24" Hydr. Spur Gears and Splines, also internal
GLEASON: No. 17 Spiral, Zerol & Hypoid, capacity 23½ P.D.

GEAR FINISHERS & TESTERS

FELLOWS: 8LSI and 13LSI Gear Lappers. External & Internal Spur and Helical
FELLOWS: No. 12-C Spacing Tester
GLEASON: No. 4 and No. 8 Bevel Gear Testers, Hand and Power Operated
GLEASON: 3" Bevel Gear Tester
NATIONAL BROACH: SIC—12" Red Ring Tester

GRINDERS—CYLINDRICAL

BROWN & SHARPE: No. 13, capacity 10"x 48", plain
BROWN & SHARPE: No. 10 capacity 6"x18" plain.
CINCINNATI, 6"x18" Hydraulic, plain
CINCINNATI: 10"x36" Hydraulic, plain
LANDIS: 16"x32" Type "D" Crankpin, Hydraulic
VAN NORMAN: #988 Crankshaft Regrinder
NORTON: 6"x18" plain
NORTON: 10"x18" plain
NORTON: 18"x18" 45° angle wheel head

GRINDERS—GEAR & SPLINE

PRATT & WHITNEY: 10" single and double wheel, hydraulic feed
GEAR GRIND MACH.: GG-19, 10"x24" Hydr. Spur Gears and Splines, also internal
GLEASON: No. 17 Spiral, Zerol & Hypoid, capacity 23½ P.D.

GRINDERS—INTERNAL

BRYANT: No. 5Y Internal
BRYANT: 112 Universal, Hydraulic
BRYANT: 18C16 Hole, Hydraulic
HEALD: 70A Plain, Internal
HEALD: 72A3 Plain & Univ.
HEALD: 72A5 Plain & Univ.
HEALD: 72A3 Sizematic Centerless
HEALD: 72A5 T-bed, Universal

GRINDERS—RADIUS

VAN NORMAN: #73, capacity 7½" diameter
VAN NORMAN: #639, capacity 7" diameter
VAN NORMAN: #649, capacity 6" to 16" diameter
VAN NORMAN: No. 3½ Universal

GRINDERS—SURFACE

ARTER: A-1—8" Rotary
ARTER: A-3—12" Rotary
HEALD: 8" Rotary
HEALD: No. 22 Rotary—12" Chuck

GRINDERS—THREAD

EXCELLO: No. 31 external, dia. 5"x18" centers
EXCELLO: No. 33 external, dia. 6"x18" centers
JONES & LAMSON: TG-1245 External, 12" dia. x 45" centers, with additional capacity if required

HONING MACHINES

BARNES: No. 306H Vertical, 24" Stroke
MICROMATIC: H-310 Double End Horizontal
MICROMATIC: H-2 Single End Horizontal, 2-spindle, ¼" to 1" dia. capacity

LAPPING MACHINES

FELLOWS: 8LSI and 13LSI Gear Lappers
NORTON: No. 28 Hyprolaps
NORTON: 2F x 40" Diameter
SCHRANER: Model A External Cylindrical Lapper—4 heads

LATHES—PRODUCTION

LIPE-ROLLWAY: 12"x30" Carbomatic, hydraulic feed
LODGE & SHIPLEY: No. 3A Duomatic
MICHIGAN: #1708 and 1712 Rollerving
MONARCH: 24"x60" Geared Head
BLOUNT: HB Polishing, 12"x48"
WILLSON: 15"x48" Geared Head Motor Driven (New)

LATHES—TURRET

GISHOLT: #2L Saddle Type, Extended bed, 24" extra length
HERBERT: Turret Lathes, all sizes (New)
WEBSTER & BENNETT: Vertical Turret Lathes, 36" and 60" dia. (New)

MILLING MACHINE

BRIDGEPORT: Vertical Miller, PF
CINCINNATI: 2-spindle Vertical Hydrotel with two rotary tables of 36" dia.
SUNDSTRAND: No. 8 Rigidmil
TAYLOR-FENN: M-80 Duplex Spline
TAYLOR-FENN: Vertical 6"x31" table with power feed, high spindle speeds
RICE-BARTON: Duplex Spline
REED PRENTICE: #5 Vertical 16"x60" table
VAN NORMAN: Contour Miller 10CT

SAWS & CUT-OFF MACHINES

MOTCH & MERRYWEATHER: No. 3 Circular Saw with auto. stock feed
RUSSELL: 9½" cut-off Saw with Auto. Stock Feed (New) Hydraulic
CAMPBELL: No. 425 Cutalator Abrasive Cut-Off, 4½" dia. capacity
WILLIAMS: 10" Pipe & Tube Cut-Off

THREAD MILLERS & TAPPERS

HALL PLANETARY: Model "D" Thread
LEES-BRADNER: LT 6"x36" Thread
LEES-BRADNER: 40A Thread Miller
MURCHEY: No. 22 Tapper, Horizontal, ½" to 2½" dia. capacity
NATCO: Vertical Tapper 18 spindle
PRODUCTO: Hand Tapper

TOOL SHARPENERS

OLIVER: 2A Face Miller Grinder
OLIVER: 10" Tool Bit-Template
FELLOWS: Flat Top Helical Gear Cutter
RANSOM: 2-Wheel Grinder 3 HP
RUSSELL: 40" Saw Sharpener (New), Automatic Indexing

MISCELLANEOUS

CUT-OFF: Campbell, Abrasive 425 Cutalator, 4½" dia. capacity
CUT-OFF: Pipe & Tube, 10" Williams
DIE SINKER: Reed Prentice No. 5, 16" x 60" table
LATHES: Blount Polishing 12"x48"
PRESS: Screw, Gen. Elec. 3 ton
RACK CUTTING MACHINE: Sykes 24" long (New)
RIVETER: Gen. Engr. 24" throat
TEST STAND: Denison 918-AM Hydraulic
PUNCH SHAPER: Sentinel Shrewsbury (New)

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- MISCELLANEOUS

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Yes, for three generations Harvey Goldman & Co. has been accumulating experience and know-how in the machine tool business. Our new plant pictured below is the result of years spent giving complete and satisfactory service to users of fine machine tools. Make Harvey Goldman *your* source for fine machine tools.

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Niles 60"x60"x24', 4-Head Planer, D.C. Reversing Drive

Norton Hyprolap #26, A.C. M.D.

Pratt & Whitney 14"x36" Surface Grinder, New 1943

Ingersoll 24"x36"x18' Four Head Planer Type Miller with Slabbing Spindle, M.D.

Cincinnati 36"x36"x16' Box Table, A.C. M.D. Planer.

BLISS Power Presses, all sizes and types

NILSON & BAIRD FOUR SLIDES

National Machinery Exchange, Inc.
128-138 Mott St., New York 13, N. Y.

MODERN MACHINES

#40 Landis Floor Type Horizontal Boring Mill
#35 Landis Floor Type Horizontal Boring Mill
6-D Potter & Johnson Automatic Chucking Machine
#35 Excello Thread Grinder
#61A Fellows Gear Shaper
#1A Warner & Swasey Chucking Machine
#30 Waterbury Farrell Thread Rollers
#0 Brown & Sharpe Automatic with Turner Drives
#3 Barber Colman Hobbing Machine
G1-A Acme Gridley 1½ Automatic Screw Machine
8 Spindle 1¾" Conomatic, late type

HAZARD BROWNELL MACHINE TOOLS, INC.
350 Waterman St. Providence, R. I.

Hex Steel Bars
190 lbs. ¾", AMS 5024
1840 lbs. ½", SAE 8740
1266 lbs. 13/16", low alloy, SAE 8735
13509 lbs. ⅞", lo alloy, SAE 9310
2148 lbs. 1¼", SAE 1137
Round Steel Bars
8000 lbs. ¼", SAE 1020
2360 lbs. .625" plus .000 minus .001, SAE 1045, ground and polished
994 lbs. 1⅛", SAE 1137
265 lbs. 1½", SAE 1137
332 lbs. 2¾", low alloy, AMS 6440
Nichrome V Ribbon Strip ¾" Wide
560 lbs. .030" 28 lbs. .026"
107 lbs. .028" 71 lbs. .025"

JOHNSON MACHINERY COMPANY
59 Edison Place Newark 2, N. J.

GEAR MACHINES
#36BM 3 spindle Gould & Eberhardt Bevel & Spur Gear Rougher—1941
#G96 Gould & Eberhardt Gear Hobber
#12—12" Gleason Two Tool Straight Bevel Gear Rougher

GRINDERS—CYLINDRICAL
10"x18" Landis Type C Hydraulic—1940
10"x18" Norton Type C Hydraulic—Reciprocating Attachment—1944
6"x18" Norton Type C Hydraulic—Reciprocating & Shoulder Attachments 1941
18"x120" Norton Plain

GRINDERS—INTERNAL
#72AS Heald Plain—Bridge—1942
#73 Heald Airplane Cylinder and Sleeve—1942
#81 Heald Plain Chuck—1941
#16A Bryant—1941

GRINDER—UNIVERSAL
12"x36" Cincinnati Filmatic Bearings

GRINDER—THREAD
Model TG-615 Jones & Lamson Automatic (Several) 1941

HEADERS
#250F Manville DSSD—1944
#2 Manville DSSD
#00 Waterbury Farrel High Speed SSSD
#00 Waterbury Farrel DSDD
#2C Manville SSSD Ball
#5 Manville SSSD Ball
#188C Manville SSSD Ball

LATHES
8"x84" Seneca Falls Lo-Swing (2)—1941
8"x102" Seneca Falls Lo-Swing
26"x33" Swift Geared Head—1941
#1 Lodge & Shipley Duomatic

MILLERS
24" Cincinnati Automatic Duplex (2)
48" Cincinnati Automatic Duplex
#34-36 Cincinnati Plain Hydromatic (2) tracer controlled—1942
#1-12 Cincinnati—1939
#08 Cincinnati Horizontal—1941
54"x18" Ingersoll Slab Miller
#36-96 Cincinnati Hydromatic Miller Several 1940

PLANER
120"x96"x20' Cincinnati Heavy Duty Box Table

PRESSES
100 ton HPM Vertical Hydraulic Fastraverse—1946
#304 Bliss Straight Side (2)

SCREW MACHINES
#2G Brown & Sharpe—1941
⅞" 4 spindle Conomatic

TURRET LATHES
#1L Gisholt Universal Geared Head—1942
#2L Gisholt Universal Geared Head—1941
#4 Gisholt Universal Ram Type
#4A Warner & Swasey Universal Geared Head
#H5 Libby Heavy Duty Geared Head—1941

MISCELLANEOUS
#3 LeBlond Rifling Machine—1941
Webster Tallmadge Single Spindle Gun Barrel Boring—1942
#430 W. F. & J. Barnes Two Spindle Deep Hole Drilling & Boring—1942
1¼" Sutton Single Cross Roll Straightener

J. L. LUCAS & SON, INC.

MACHINE TOOLS *Established in 1905*

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SOME LATE MACHINES STILL AVAILABLE

BORING MILLS

Bullard 24", VTL New Era
Cleveland 2½" Bar Cap.
Giddings & Lewis No. 0, 3" cap.
Giddings & Lewis No. 32, 3½" cap.
King 42" Vert. 2 rail heads
Niles-Bement-Pond 4" Bar
Niles-Bement-Pond 4½" Bar
Niles-Bement-Pond 60" Vert.

DRILLS AND RADIALS

Bausch Multi-spindle
Bausch Radial Drill & Tapper
American 6'x15" Univ.
Buffalo #2 Motor Spindle
Cincinnati Bickford 6'x13" col.
Foote-Burt #25
Walker-Turner Radial. 2½'
Leland Gifford 2LMS (2)
Natco Multi-spindle

ENGRAVERS

Auto Engravers Bench Type
Deckel GK2 Type 3 Dimensional, New
Gorton #1A 2 Dimensional
Gorton #3B 3 Dimensional

GEAR EQUIPMENT

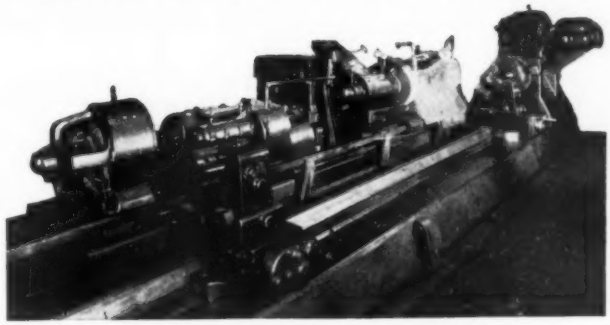
Barber-Colman #12 Hobbar (2)
Fellows High Speed Shapers 712, 72, 725, 71
Flather 72" Cutter
Gleason 3" Straight Bevel Generator
Gleason #4 Angular Bevel Tester
Gleason #2 Surface Hardener
Gould & Eberhardt 36" Cutter
National Broach Red Ring Lapper, Shaver
Schuchardt & Schutte #1 Hobber
Fellows #20M Redliner

GRINDERS, MISCELLANEOUS

Bryant #5 Internal
Covel #91A Univ. Tool & Cutter
Grenby Int. 1G-12, G2
Heald #73 Internal centerless
Heald #81 Internal Gagematic
Heald 72A3 Int. Centerless Sizematic, #1 Tool
Landis 12"x36" Univ., Latest
Landis 6"x30" Type C Cyl.
Majestic Internal
Norton 6"x18", 6"x30", 10"x18" Type C cyl.
Norton 14"x48" Type C Univ.
Norton Roll Grinder 50"x28'
Oliver #510 Drill Pointer, Sellers 4G, Black Diamond
Port Cable Belt WGB, G8 Grenby Int.
Pratt & Whitney Contour
Pratt & Whitney Radius #R6, K.O. Lee Tool
Van Norman #666 Crankshaft
Vernon Tool & Cutter
Wicaco Internal

GRINDERS, SURFACE

Abrasive 3B 8x24", #33, #34 Vert.
#10 Blanchard 16" Chuck
Blanchard #16, 30" Mag. Chuck
Brown & Sharpe #2 Mag. Chuck
G & L #45 12"x24" Hyd. Feed, #5, 10"x36"
Heald 22—12" chuck, Arter 12"
Norton 6"x18" Hyd.
Pratt & Whitney 12x36" Vert
Reid 11x36 Motor in Base



Norton Roll Grinder 50" x 28' (actual photo)

LATHES

Lodge & Shipley #3 Duomatics
Hardinge Precision 9", 1" Collet Cap., Rivett
Hendey 12"x42" Geared Head Late
Hendey 14" Yoke Head Lathes
LeBlond Regal 10"x3' bed
Lipe-Carbo 12x18" (2)
Monarch 10"x20" EE Latest (3)
Monarch 12"x30" CKK Late (2)
Putnam 36"x22'
Putnam 42"x17'
Sebastian 12"x4' G.H.
Wickes 32"x35' Geared Head
Sundstrand 8x15"
Sundstrand 15" Stub

MILLS, PLAIN, UNIVERSAL & PROD.

Archdale Plain, 14", Prod.
Brown & Sharpe #000, 21
Burke #4 Plain & Univ. Vert. Hd.
Cinn. 08 Plain
Cinn. 1-12 Mfg.
Cincinnati, 1 M Univ. #2 Dial Type
Kent Owens 1V, 1M
Simmons Micro-Mill
Sundstrand 0,00 Rigidmil
118 Van Norman, Prod.
6"x20" P&W Thread Mill
Van Norman #2 Universal

MILLS, VERTICAL

Brown & Sharpe #3 single pulley drive
Cincinnati #4, 08 Vert. #2, 3, SPD
Morey #12M Profiler, 2 sp.
Pratt & Whitney Profiler 12B, 2 SP

PRESSES

Bliss 304A 4" Str.
Bliss 645, 650 Hi-Production Presses
Bliss 18, OBI, 58, 62, 162 OB.
Bliss 4½ Double Action, Roll Feeds, Cam (2)
Bliss #78½, 330 Ton, SS, Bliss 74½
Bliss 31½A Double Action Toggle
Ferracute EGS4, 400 Ton Knuckle
Niagara Horning, 15 Ton
Niagara A1¾, O.B.I.
Toledo 400 Ton Knuckle Joint #663
Toledo 29 Double Action Cam
V. & O. #102 O.B.I. Reducing

TURRET LATHES

Acme 6W Fox 2 9/16" Cap.
Brown & Sharpe, #1, 2 Hand, #10, 11
Denver, 6, 2" Shell Turret (3)
Foster #3B 4½" Cap.
Gisholt #4 Bar, Feed, Late.
Jones & Lamson 2½" Saddle Univ. Late
Libby #4R 2" Cap. Univ. Late
Morey #2G Late
Oster 601 WD, #2 Simmons Microspeed
Warner & Swasey #1A, 2A
Warner & Swasey G.H. #5 Univ., Late
Warner & Swasey #2, Late

HYDRAULIC EQUIPMENT

SELF CONTAINED PRESSES

500 ton Shaft Straightener 24' Long Bed. Watson Stillman
125 Ton Southwark Press, Bed 96"x30". 30" stroke, 2 to 4 ft. opening
80 Ton Wilson Press, 51"x24" Platen, 11½" St. 13" opening
50 Ton William & White, 20" St. 54"x 20" Bed—24" opening

MISCELLANEOUS PRESSES

300 Ton Watson Stillman 24x20" Platen 11" St. 21" opening

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Air Hydraulic Presses — Arbor Presses #6C Famco — Band Saws Kalamazoo — Famco 6x12"—Drill Presses all sizes—Hydraulic Press Northern 20 Ton—Injection Molders, 1 ounce—Power Presses, OBI, 1, 4, 4½, 5, 7½, 10, 15, 20, 30 ton —Shaper 7" Amco, 8" Shaperite—Shaper Sheldon 12"—Shears, Foot 22" to 8', 16 & 18 ga.—Shears, Power 3'x18 gauge to 10' x 10 ga.—Welders, Arc, Seam, Spot all sizes—Vert. Milling Attnch. Halco H.S. Motors Grinders, Buffers, all sizes.

MISCELLANEOUS

Automatic, Cleveland Model B 1 1/16"
Automatic B & S #00G
Automatic 4 Sp. 1½ Conomatic
Band Saw: DoAll Zephyr 36"
Band Saw: #8 Marvel
Filers—**DoAll Band Filer**
Filers—**Grob Band Filer**
Hacksaw: Peerless 6"x6"
Hacksaw: Racine 10x10" Hyd.
Honer: Micromatic #H-1
Keyseater: Devie, Baker, M & M
Shapers: **24" Rockford, 24" Cinci., 28" Gould & Eberhardt. Many Others**
Tappers: **#1 Bakewell, #3C Haskins**
Vertical Shaper: Pratt & Whitney 6" Model "B" 1941
Welder: 50 KVA Eisler Air Operated
Welder: Taylor-Winfield 50 KVA H1-Wave

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ǂ00 Roller Bearing Turret Formers, serials 10533, 10531, 10530, 10529, 10528, 10527, 10241, 7318, 4463, with new Turner Uni-Drive. Price, each **$1775.00**

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ǂ2, serial 4964, with new Turner Uni-Drive **$2775.00**

ǂ2G, serial 4577. Price **$3775.00**

ǂ6 Brown & Sharpe, 2" capacity (2).

2—ǂ1 FU Foster Fastermatic Automatics, Late, with Air Chuck and Air Cylinder

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LATE MODEL MACHINE TOOLS . .

AUTOMATICS

1-1/16" Model A Cleveland. 1942.
20"x25" Fay Automatic. 1942.
No. 3-S Cece ⅝" Cap. 1942.

DRILLS

No. 4BM Fosdick. 1942.
No. 2 LMS Leland Gifford Hyd. 1942.

GEAR EQUIPMENT

No. 645A3 & 81A Fellows Gear Shaper. 1944
No. 6 Gleason Revacycle. 1940.
No. 6 Gleason Gear Tester. 1942.
8" Red Ring Internal Shaver. 1942.
15" Red Ring Lapper. 1942.
Red Ring Universal Tester. 1942.

GRINDERS, CYLINDRICAL

14"x196" Norton Plain Type C. 1942.
14"x48" Norton Pl. Type C. Hyd. 1941.
14"x36" Landis Univ. Type C. Hyd. 1942.
12"x36" Norton Universal. 1941.
10"x18" Norton Type C Plain. 1942.

GRINDERS—INTERNAL

No. 24-36 Bryant. 1943.
No. 16 CP 16 Bryant. 1942.
No. 16-16 Bryant. 1942.
No. 172 Heald Hyd. Gap. 1940.
No. 81 Heald Plain Hyd. 1940.
72A3 Heald Plain Hyd. 1942.
No. 50 Heald Hyd. 1943.

GRINDERS—THREAD

No. 35L Excello Precision. 1943.
No. 31 Excello Precision. 1940.

GUN BARREL MACHINES

No. ½B x 50 P&W Reamer. 1942.
No. ½Bx30 P&W Reamer. 1942.
No. ½B x 50 P&W Rifler. 1942.

LATHES—ENGINE

20"x240" LeBlond. 1941.
20"x72" Reed-Prentice. 1942.

LATHES—PRODUCTION

No. 4D Potter & Johnston/ 1941.
No. 12 Gisholt Hydraulic. 1943.
No. 10 Sundstrand Automatic. 1943.
No. 3 FU Foster "Fastermatic". 1942.
14"x42" Monarch "Magnamatic". 1941.
Lipe Carbo-Matic. 1942.
LeBlond Multi-Cut. Late.
No. 4-14 Lo-Swing. 1941.

LATHES, TURRET

No. 3 Gisholt Universal. 1942.
No. 5 Gisholt Universal. 1942.
No. 4 AR Libby Universal. 1942.
No. 2 W & S Simplified. 1941.

MILLS, PRODUCTION

No. 34-36 Cincinnati Hydro. 1942.
No. 2-20 Kent Owens. 1942.
No. 1-14 Kent Owens Hyd. 1942.

MILLS, THREAD

6"x6" LT Lees Bradner. 1942.

MISCELLANEOUS

48"x⅛" Niles Plate Straightener.
No. 616 Cleveland Rigidturner. 1942.

SHAPERS

20" Cincinnati Plain. Late.
6" Pratt & Whitney Vertical. 1942.

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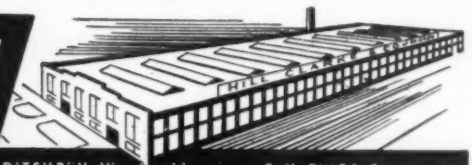

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AUTOMATICS

1-1/16" Model A Cleveland (1942)

DRILLS

1 Spdl—26" Sw—No. 2 LMS L.G. Hyd.
2 Spdl—24" Sw—No. 2 Aveymatic
6 Spdl—14" Sw—No. 2 LMS L.G. Hyd.
1-Spdl—2¼ Colburn, No. 5 Taper
4' 11" Cannedy-Otto Radial
D-31 Fox Multiple Drill

GEAR MACHINES

No. 12 HS Gould & Eberhardt Hobber
No. 12-H Gould & Eberhardt Hobber
11" Gleason Bevel Gear Generator
No. 1 Whiton Auto. Gear Cutter
No. 6 Gleason Bevel Gear Tester (1942)
No. 36-BM G & E 3 Spdl. Rougher
No. 65 Fellows—Cone Dr.

BORING MACHINES

21" Lucas Hor. Bor. Mill.
Rockford—3¼" Bar
42" N-B-P Vert. Bor. Mill.
72" Nile—Hvy. Pattern

GRINDERS

4"x18" Landis, Model 4H
6"x18" Norton Type C Plain (1943)
6"x30" Norton Type C Plain (1943)
10"x36" Norton Type C (1943)
10"x72" Landis Type C Hydraulic
Hill-Clarke Norton Type Motor Driven Grinders
10"x36" centers
10"x50" centers
10"x72" centers
10"x96" centers
14"x36" centers
14"x72" centers
16"x120" centers
16"-40" gap x 120" centers
18"x96" centers
18"-30" Gap x 96" centers
20"x96" centers
24"-32" Gap x 144" centers
26"x72" Norton Crank Shaft Grinder
15"x15"x8' Norton Surf. Gdr.
No. 25-A Heald Surface Grinder
No. 72-A-3 Heald Internal Gdr.
No. 72-A-5 Heald Internal (1942)
No. 16-16 Bryant Internal Grd.
No. 16-28 Bryant Internal Grd.
No. 24-26 Bryant Internal Grd.
No. 81 Heald Centerless Internal
No. 74 Heald Internal Centerless

LATHES

14"x6' Walcott Lathe
17"x8' Le Blond Hvy. Duty Lathe
20"x9' Chard Lathe
36"x18' Putnam Grd. Hd., M.D.
No. 4 Warner & Swasey Tur.-Bar Fd.
No. 5 B & O Tur. Lathe, Cone Hd.
No. 6 Warner & Swasey Tur.-Bar Fd.
2¼"x24" Jones & Lamson
No. 2A Warner & Swasey s.p.d.
No. 3A Warner & Swasey (1941)
20"x8' Fay and Scott
18" Libby Tur. Lathe, M.D.
21" Gisholt, M.D.

MILLING MACHINES

No. 08 Cincinnati Plain
No. 08 Cincinnati Vert.
No. 3 Sundstrand Rigidmil
6"x36" Lees-Bradner — Model LT (1943)
6"x80" Pratt & Whitney Thrd. Mill
6"x132" Pratt & Whitney Thrd. Mill
6"x168" Pratt & Whitney Thrd. Mill
10"x48" Hanson-Whitney Thread (1942)
10"x60" Pratt & Whitney Thrd. Mill

MISCELLANEOUS

No. 151 Besley Dbl. End Disk Gdr.
24" Lutter & Geis Shaper
15" Dill Slotter
18" Dill Slotter
38" Morton Draw-Cut Shaper (1945)
18" Newton Slotter
No. 0 Bakewell Tapper
Baush Radial Tapper
No. 307 Barnes Hone
Model 200 Micromatic Horiz. Hone, 1 Spdl.
Model H-2 Micromatic Horiz. Hone, 2 Spdl.
Model 200—H5 Micro.—Horiz.—2 Spdl.
14' Niles-Bement-Pond Roll
Am. Chip Wringers (New) 3.3 to 12.6 bushel capacity
No. 6 R & K Straight-side Press, M.D.
4-B Marvel Hack Saw
48"-14 Ga. Economy Shear, M.D.
No. 5 Reynolds Power Screw Driver

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36"x36"x12' Cincinnati, 2 hds.
36"x36"x12' Gray, 2 Hds.
42"x42"x10' Cincinnati 2 hds.
48"x36"x14' Gray, 2 hds.
48"x48"x12' Cincinnati; 2 hds.

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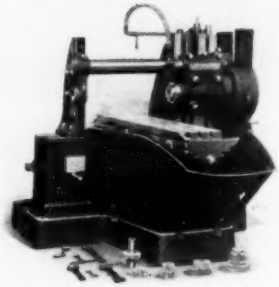

48" Cincinnati Plain Automatic Miller

LATHES

25"x150" centers LeBlond Heavy Duty 16-speed Grd. Hd., MD
14"x30" centers Lodge & Shipley Selec. Grd. Hd., MD
16"x54" centers Sidney Tritrol 16-speed Grd. Hd., MIL
18"x46" centers American 12-speed Grd. Hd., MIL
20"x25" Fay Automatic, new 1943
20"x94" centers American Grd. Hd., MD
21"x136" centers LeBlond Hvy Duty, Turner drive, taper
24"x51" centers Lodge & Shipley Selec. Grd. Hd., arr MD
24"x60" centers American Hvy Pat 12-speed Grd. Hd., MD, taper
24"x72" centers Bridgeford, Cullman drive
30"x127" centers Lodge & Shipley, cone

MILLING MACHINES

No. 1-B Milwaukee DOA Plain, MD
No. 2 Cincinnati H.P. Plain, MD
No. 2-B Brown & Sharpe Heavy Plain
No. 2-M Cincinnati Univ., MD
No. 3-B Milwaukee Univ., SPD
No. 4-B Brown & Sharpe Heavy Plain, MD

GEAR MACHINERY

No. 7 Fellows High Speed Shaper
Nos. 12 and 2 Barber-Colman Hobbers
No. 18HM Gould & Eberhardt Double Spindle Hobber
No. 4-36" Brown & Sharpe Cutter
No. 61 Fellows Shaper, MD
12" Gleason Bevel Gear Planer
18" Gleason Bevel Gear Generator

GRINDERS

No. 510 Oliver Drill Grinder, late
No. 11 Brown & Sharpe Plain Cylindrical, BD
No. 3 Abrasive 8"x22" Surface, BD
18"x72" Norton Plain Cylindrical, MD
20"x144" Landis Plain Cylindrical
No. 49-53 Besly Vert. Spindle Disc, motor-on-spindle

PRESSES

No. A-3 Robinson OBI, 32-ton
No. A-4 Robinson OBI, 56-ton, MD
No. 77 Toledo OB, 85-ton, grd.
No. 2-DT CANCO Deep Throat Horning
No. 5-H Cleveland Horning

Many other machines in stock. Write for stock list.

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No. 5 WARNER & SWASEY Universal Ram Type Turret Lathe, hardened ways, Timken spindle, motor in base, bar feed, chuck, 1936

No. 7A JONES & LAMSON Universal Saddle Type Turret Lathe, preselector head, hardened ways

14"x54" MONARCH Model "C" Toolroom Lathes, chucks, collets, taper, new 1941

100" BETTS Vertical Boring Mill, 2 heads, rail adjustable on housings with pegs, DC motor with self-contained motor generator set, new 1944, perfect condition

100" BERTRAM (Niles Patterns) Vertical Boring Mill, 2 heads on rail, rapid traverse

No. 5-48 CINCINNATI Plain Hydromatic Milling Machine, new 1942

No. 18-48 KEARNEY & TRECKER Duplex Production Mill, 1942

No. 2 BROWN & SHARPE Light Type Vertical Mill, new 1942

No. 2D KEARNEY & TRECKER Rotary Head Die Miller, cherring attachment, right angle milling attachment, slotting attachment, rotary table, measuring rods, new 1943

12"x24" NORTON "Multi-Purpose" Universal Grinder, internal attachment, 1943

No. 10 BROWN & SHARPE Tool Grinder, 1943

6"x18" NORTON Hydraulic Surface Grinder, Magnetic Chuck, 1941

8"x24" ABRASIVE Hydraulic Surface Grinder, magnetic chuck & wet grinding attachment, 1943

JONES & LAMSON 14" Pedestal Type Comparator, with attachments, 1942

No. 4BM FOSDICK Single Spindle Drill, No. 3 Morse taper, 1942

No. 7125A FELLOWS High Speed Gear Shaper, change gears 1943

No. 5 JOHNSON O.B.I. Press, new 1944, 55 tons

25A HEALD Rotary Surface Grinder, 24" diameter, magnetic chuck

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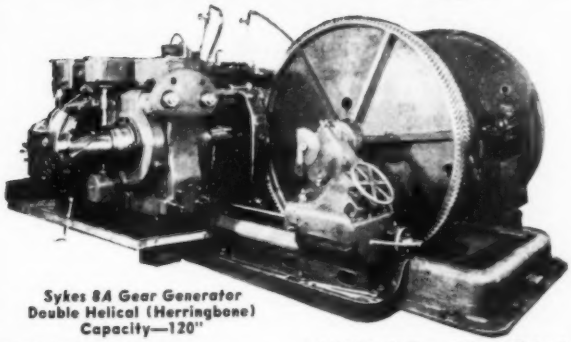

Sykes 8A Gear Generator
Double Helical (Herringbone)
Capacity—120"

BORING MILLS—Horizontal
FRANKLIN 4¾" Bar; table type; M.D.
LANDIS #40, 4" Bar; floor type; M.D.
LANDIS No. 35 3½" floor type; Bar
NILES 8" bar floor type, motor drive

BORING MILLS—Vertical
BULLARD 24" Power Rapid Traverse
BULLARD 16" 6-spindle "A" Mult-au-matic;
NILES 36-44" side head; M.D. Late
NILES-BEMENT-POND 144"; hvy M.D.

BROACHES
AMERICAN Mod 6-G Hydr. Rifle Broach
CINCINNATI 1-30 Duplex Vert. Hydr.
LaPOINTE #2L M.D. Late

CRANES
MILWAUKEE 5-ton; spans, 22'2"; 24'; 25'; 36'11"; 37'2"
MILWAUKEE 10-ton; span, 36'
MILWAUKEE 25-ton; span, 34'4"

DRILLS—Miscellaneous
BARNES No. 420 Deep Hole; late
BARNES H-3 Hydram; hydr.; Inverted; late
BARNES H-2 Hydram; hydr.; M.D.
BARNES 20" 4-spindle; Camel Back; Late
BARNES 24" all geared; Camel Back; M.D.
BAUSH 1¼x30" Deep Hole; Late
EDLUND 2B, 3-spindle; 1⅝" Dia.
MOLINE 6-spindle Multiple Hole-Hog; 3⅝" dia.; M.D.
NATCO 2BL Mult.; Holesteel; PRT; M.D.
NATCO No. 14 Mult.; Rect. Hd.; PRT; M.D.
NATCO D-8 Multiple; adjustable; Late
BODINE #42-20 multi-univ., dial feed; M.D.

RADIAL DRILLS
CARLTON 6'17" plain; M.D.
CINCINNATI BICKFORD 6'15" Univ.; M.D.
DRESES 5'15" Universal; M.D.
NILES-BEMENT-POND 6'15"; S.P.D.

GEAR CUTTING EQUIPMENT
BROWN & SHARPE #13 Spur Bevel Cutter
BROWN & SHARPE 6-72" Auto. Cutter; M.D.
CROSS No. 1 Tooth Rounder; M.D.
FELLOWS Nos. 61A, 62S, 71S, 75, 7, 7A, 75, 72, 77 High Speed Gear Shapers; late
FELLOWS 8-M Red-Liner; M.D.; Late
FELLOWS 12-M Involute Meas. Instr.; Late
FELLOWS 13-LS Lapper; late
GLEASON 8" & 12" Straight Bevel Gen.; late
GLEASON 10", 11" & 18" Bevel Gear Gen.
GLEASON 24", 37", 77", 96" Bevel Gear Planers; M.D.
GLEASON No. 14 Hypoid Grinder; late
PRATT & WHITNEY 10" Gear Grinder; late
SYKES #4A gear generator; M.D.
SYKES #8A gear generator; M.D.

GEAR HOBBERS
BARBER COLMAN #12 dble. overarm; M.D.
GOULD & EBERHARDT #24H. Late
GOULD & EBERHARDT #36BM 3 spindle Auto. Rougher; M.D.
KOEFFER WM-11 Auto.; bench type; Late

GRINDERS—Plain Cyl. & Univ.
BROWN & SHARPE No. 1 Universal; late
BROWN & SHARPE No. 5 Plain; cap. 3x18"
LANDIS 6x18" Type C Plain; Hydr.; late
LANDIS 10x18" type C plain Hydr. M.D.
LANDIS 29"x130" centers Plain; M.D.
NORTON 10x72" type C Plain; Late
NORTON 17x42" centers crankpin; Hydr. Dble. hd.; M.D.

GRINDERS—Miscellaneous
BRYANT No. 3, 5, 16-C-16, 16-CP-16, 24-36" Internal hydr.; Late
GLEASON No. 12 Tool Sharpener; late
HEALD No. 72-A-5 "Gagematic" Int.; Late
HEALD No. 72-A-3 "Gagematic" Int.; Late
LEMPCO 22x72" Mod. KG Crankshaft; Late
PRATT & WHITNEY B 14x36" Hydr.; Late
SHEFFIELD Micro-Form Grinder; late
THOMPSON 6x48" Auto. Rd. Broach; M.D.
VAN NORMAN 666 Crankshaft Regrind
VAN NORMAN 639 Osc. type Radius; Late

LATHES ENGINE & MFG.
AMERICAN 24"x220" centers; Timken; Late
AMERICAN 36"x360" centers; 2 carriages
AMERICAN 36"x32' centers geared; heavy
HARDINGE T.R.59 Bench type; Late
JONES & LAMSON "FAY" 20x25" Automatic; M.D.; Late
LEHMANN 25x96" cntr; TIMKEN; grd M.D.
LeBLOND 16x36" cent.; Auto.; Timken; late
LeBLOND Mod. 7ACL Crankshaft; M.D.
LODGE & SHIPLEY 24x120" centers, Late
LODGE & SHIPLEY No. 5—24" and 96" centers DUOMATIC; Timken; Late
LoSWING 4x60", 8x24", 8x108"; late
MONARCH 16x28" cent., geared head; M.D.
MONARCH 22x456", 3 carr. CM TIMKEN
MONARCH 14x42" centers "Z" Magnamatic Auto.; TIMKEN; M.D.; Late
NILES 80"x50' Boring "Time-Saver"; Timken; Late
NILES 48"x32' centers Engine; geared; M.D.
REED PRENTICE 16"x24" centers grd; M.D.
SPRINGFIELD 14"x43", geared; M.D.

LATHES—TURRET
GISHOLT No. 3, 4, 5 Ram; TIMKEN; Late
MOREY No. 2, 3 ram type TIMKEN

MILLING MACHINES—Plain
CINCINNATI 0-8; M.D.; Late
CINCINNATI 4-48, 4 spindle, Tracer; Late
CINCINNATI #24 Duplex; SPD
GOULD & EBERHARDT 25 Cont. type; M.D.
CINCINNATI No. 4 High Power; TIMKEN; Rect. M.D.
SUNDSTRAND No. 3 Rigidmill; TIMKEN Late

MILLING MACHINES—MFG.
HALL Style D Planetary; Late
INGERSOLL 32x24x16' Planer Type; 2 hds
INGERSOLL 30x24x12' Adj. Rail Slab; M.D.
INGERSOLL 42"x42"x16', 4 heads, Planer Type, Late
SUNDSTRAND Mod 3A Duplex 42" feed M.D.
TAYLOR & FEN M-80 Duplex Spline; Late

MILLING MACHINES—Vertical
CINCINNATI 0-8 Mod EA Automatic PRT; M.D.; Late
SUNDSTRAND Mod. 3A Rotary Rigidmill

MILLING MACHINES—Thread
LEES BRADNER HT 12"x36" M.D. Late
MOREY 12x30", 12x60" centers; late
PRATT & WHITNEY 4½x12 Mod. C; late
PRATT & WHITNEY 6x132; M.D.

PLANERS
BETTS (CONSOLIDATED) 84"x92"x16' 4 heads PRT Box Table; DC Reversing M.D.
BETTS (CONSOLIDATED) 108"x84"x44'; 4 heads; PRT; Box Table; M.D.
CLEVELAND 48"x48"x12' Openside; AC; M.D.
DETRICK & HARVEY 48"x48"x16' hydr. table feed; 4 heads; M.D.
LIBERTY 48"x48"x16' 4 hds. Double housing; vari-voltage
LIBERTY 72"x48"x20' 4 heads; Convertible openside vari-voltage drive; late
NILES 108"x84"x42' 4 heads; Rapid Traverse; Box Table DC; M.D.
NILES-BEMENT-POND 72"x72"x30' 4 hds.; Rapid Traverse; M.D.
SELLERS 60"x60"x12' 4 heads vari-voltage dr.; PRT
WOODWARD & POWELL 54"x84"20'; 4 heads; M.D.

SAWS
ESPEN LUCAS No. 670-30" cap Hydr.; Late
HELLER Model SS-1, 6¾" Cap Cold Saw

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LYND FARQUHAR 26" Openside; M.D.
NEWTON 15" Slotter; M.D.

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CINCINNATI 325 ton Vert Hydr; Late
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CHAMBERSBURG Horiz. Straightening; 24" str.; M.D.
BLISS No. 3½A geared toggle; dble. acting
GLEASON 15", 25" Quenching; hydr.; M.D.
NIAGARA No. 512 DG tie rod; 282 tons; M.D.
UNITED ENG. 500 ton hydr. forging

MISCELLANEOUS
ACME 2" forging, upsetting; late
AJAX 3½" forging, upsetting; M.D.
BAKEWELL No. 1, 1R Precision Tapper
BAKER #5 Keyseater; motor drive
BARNES No. 172, 214 Honing; hydr.; Late
DeLAVAL No. 194 Coolant Clarifier; Late
FISCHER No. 1, No. 2 Oil Groover; Late
FOSTER 4x36" centers; Superfinisher; Late
GROB OS-20 Metal Band Saw—Filer; M.D.
GROB NS-24 Band Saw; M.D.; Late
LANDIS 2" sgle. Dble. Spdle. Threaders; M.D.
MANVILLE 2C Auto Screw Slotter; M.D.
MANVILLE No. 2 Slotters; Late
MANVILLE No. 3 Trimmers; Late
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LeBLOND #2 Barrel Lapper; M.D.; Late
US TOOL 810-B Cutter Reliever; Late
NORTON 2F, 26F Lapping Machines; Late

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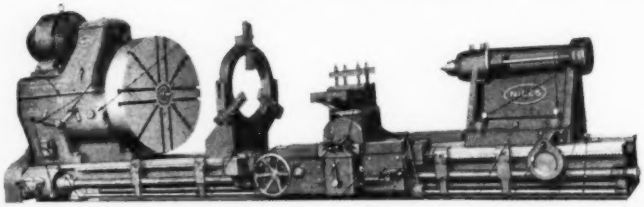

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GEAR PLANER, "11" Rienecker, Bevel
GEAR SHAPER, No. 75 Fellows High Speed
8IA, 64 & 64A, 6 Fellows
GRINDERS, 20"x120" Landis, Cyl., Hyd., AC
GRINDER, 18"x48" Cincl., Cyl., M.D.
GRINDER, No. 6-7 Sellers, Tool, '42
GRINDER, No. 16Y28 Bryant, Int., 1943
GRINDER, No. 174 Heald Gap, Int. 54" sw., '42
GRINDER, No. 72AS Heald Internal, 1943
GRINDER, No. 75A Heald, Int. Hand Feed
GRINDER, Micro-Internal, Large
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22"x24¾"x48" cen. Skoda, New
20"x48" cen. American, T.A., (2)
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TAPPERS, No. 1 & 2 Bakewell (4)
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28" Libby "C" 4½" capty.
No. 1B Foster Univ., 2" capty. (2)
No. 2B Foster Univ. 5¼" capty. Bar.
THREAD MILLER, 12"x80" Morey Shields, '42
MILLER, UNIV., No. 2A B. & S., M. in base, Timken Nos. 2 & 3 Cincl. Pl. Cone Motorized
MILLERS, HORIZ. No. 4 Cincl. High Power
MILLER, HORIZ., No. 2 Heavy K.&T., M-in-base
PIPE THREADER, 2" Landis, AC, M.D.
PLANER, 48"x36"x8' Cincl. 4 Hd., Box, PRT, Force Feed
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SHAPERS, 24", 20" & 16" G & E., AC, M.D.
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4" Detrick & Harvey floor type
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15", No. 2 Avey, 1 & 4 spdl., hydr. feed
16" Sipp, 2 & 3 spindle
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Barnes horizontal radial
3' Carlton sensitive radial
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No. 75A Heald hand feed
Nos. 72A3 & 72A5 Heald
No. 72A3 Heald, cross sliding, head
No. 72A3 Heald Sizematic
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Granby bench type

GRINDERS, SURFACE

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14"x36" Pratt & Whitney vertical
8"x24", No. 78 Wilmarth & Morman
8"x22", No. 3 Abrasive
14"x48", No. 5 Abrasive

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No. 2 Cincinnati, horiz. & vertical
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No. 4-36 Cincinnati Hydromatic
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Nos. 1, 2 & 3 Kent Owens hand
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14x54 HENDEY 12-speed Engine
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No. 5DE Potter & Johnston Aut. Turret Lathe

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No. 26 VAN NORMAN Ray Type Univ. Miller
No. 2KM KEARNEY & TRECKER Vert. Miller
#12M MOREY 2-spindle Vert. Miller and Profiler, 1942
36"x36"x18' INGERSOLL Adjustable Rail Planer Type Miller, 40 HP AC Motor Drive, One Rail Head, Two Side Heads
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10"x72" LANDIS Type C Hyd. Pl. Grinder, 42.
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No. 16/28 BRYANT Hyd. Internal Grinder
No. 174 HEALD Hyd. Gap Internal Grinder
No. 2 NORTON Cutter & Tool Grinder

DRILLS

No. 2LMS LELAND GIFFORD 2-spindle on 4 spindle base
No. 3MS LELAND GIFFORD 2-spindle, hydraulic feed

GEAR EQUIPMENT

No. 725A Fellows High Speed Gear Shaper
No. 36BM GOULD & EBERHARDT Gear Rougher
#12 FELLOWS Gear Shaver

MISCELLANEOUS

#31 LUCAS Horizontal Boring, Drilling and Milling Machine, 3" bar
No. 25-RT G & L Horizontal Boring, Drilling & Milling Machine
16" GEMCO Shaper, M.D.
20" STEPTOE Shaper, Univ. Table
No. 1½B P & W Two Spindle Reaming Machine, 1944
41½"x36" PRATT & WHITNEY Model C Thread Miller
Model H-1 MICROMATIC Hydrohoner
6" TAYLOR & FENN Spline Millers
⅞" CONOMATIC 4-spindle Auto. Screw Machines
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NILES 60"x26½' Geared Head Engine Lathe—10' centers, MD.

MOREY #2G, 1"x6" Geared Head, Back-Geared, Ram Type Turret Lathe, MD, Bar Feed, Late Type. MOREY #3 Universal Turret Lathe, Ram Type, 1½"x10" capacity, MD, Late Type.

BROWN & SHARPE #2 Wire Feed Screw Machine, 1-9/16" hole thru spindle, 12½" swing, MD, Late Type.

GRINDERS

NORTON 24"x240" Type "A" Cylindrical Grinder, work and roll rests.

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BROWN & SHARPE #20 Plain Cylindrical Grinder, 10"x18" capacity, electrically controlled, Late Type.

LANDIS 8"x18" Type "C" Hydraulic Cylindrical Grinder, 4-motor drive, Power rapid traverse, Late Type.

NORTON 10"x48" Type "C" Cylindrical Grinder, MD, Late Type.

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E-2	6.00	N-1	24.00
F-1	9.00	N-2	24.00
F-2	8.00		

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How Republic Metallurgical Service

smoothed out a burnishing problem

Jan. 26 Republic Field Service gets trouble call at 10 a.m.

Jan. 26 Union Drawn Machining Specialist contacts customer at 1 p.m. same day. Learns of difficulty in burnishing reamed hole, sketches suggested tool to give 5 to 10 micro-finish.

Feb. 2 Union Drawn Machining Specialist calls back to check tool drawings; makes corrections.

Feb. 23 Another call to check tool progress finds it almost completed.

Mar. 1 Union Drawn Machining Specialist checks alignment of burnishing tool on six-spindle automatic. Suggests set-up changes.

Mar. 8 On call from customer, Union Drawn Field Man checks burnisher operation; spots construction fault; makes on-the-spot correction. Parts come off as predicted – burnished finish is under 10 micro-inches. He stays on job until late that night.

Mar. 9 Union Drawn Man returns to see if any difficulty has occurred. Finds job running smoothly, with machine efficiency greatly increased.

from problem

to production—

6 WEEKS!

● This Union Drawn Steel customer needed volume production of automatic transmission parts . . . needed it fast. Specifications called for a 40 to 60 micro-inch finish on a two-step internal bore, machined from Union Cold Drawn B-1113 2⅛" round bar stock.

Inability to hold the finish below 100 micro-inches caused difficulty. So, a rush call went out for Republic Metallurgical assistance.

A Union Drawn Machining Specialist looked over the job, and designed a new broaching fixture and head. According to the customer's latest report, "we are now running this job from 2 to 20 micro-inch finish . . . production has increased about 18%."

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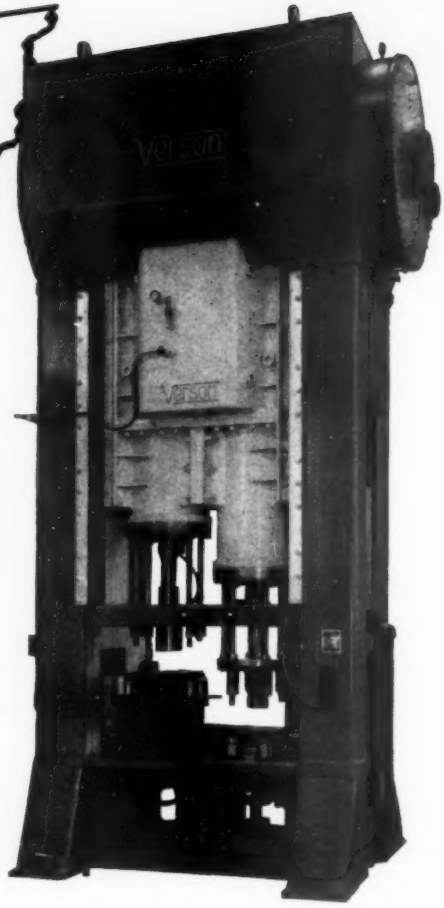

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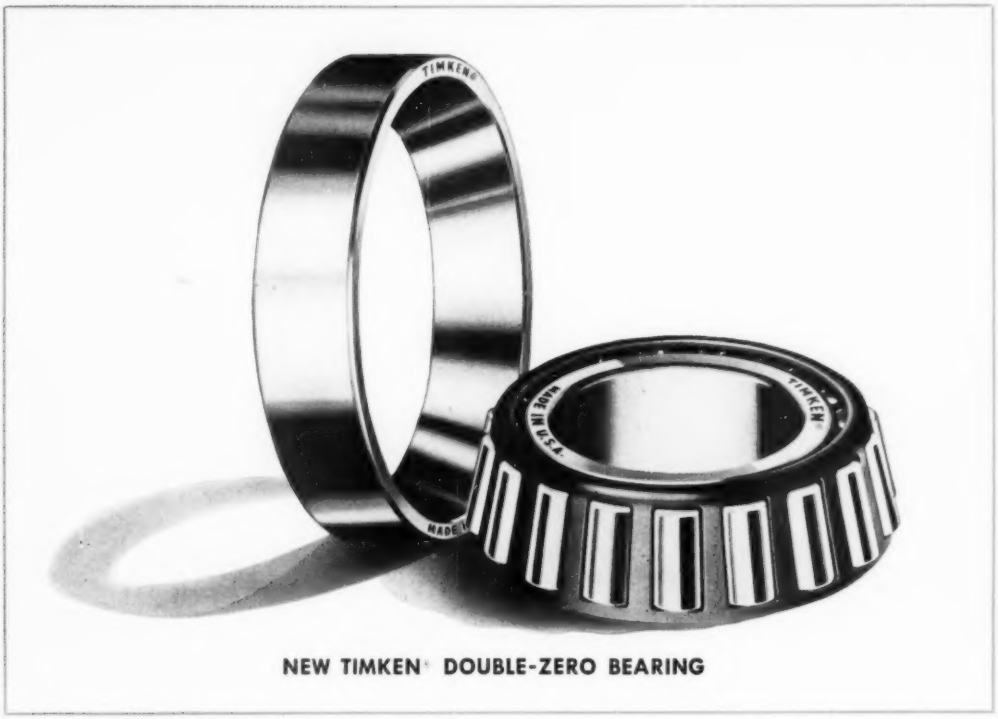

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